amateur radio

MARCH, 1973

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MODEL OL-64D — Price $19.75

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MODEL CT-500/P — Price $16.75

Popular, medium-size, mirror scale, over-loaded protected. AC volts: 10, 50, 250, 500, 1000 (10K o.p.v.). DC volts: 2.5, 10, 50, 250, 500, 5000. DC current: 50 uA., 5 mA., 50 mA., 500 mA. Resistance (ohms): 12K, 120K, 1.2M, 12M. dB. scale: minus 20 to plus 62 dB. Approx. size: 5½ x 3½ x 1¾ inches.

MODEL A-10/P — Price $55.00

Giant 6½ inch meter. In-built signal injector, overload protected.
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HAM

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amateur radio

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CONTENTS

COVER STORY

VK3SS operating from Mt. Tamboritha in early December on a search and rescue operation. (See page 24.)

QSP

"... AND SO TO THE SECOND YEAR"

This issue of "A.R." marks the beginning of the second year of publication of the magazine by the Executive.

Early in 1972 a band of "volunteers" was gathered together to form a new Publications Committee—a committee charged, very early on, with the seemingly impossible task of placing "A.R." back on its financial feet without lowering the standard of publication.

As a result, a number of changes have occurred over the past twelve issues. Changes that were made in an attempt to improve the content and appearance of the magazine, but were constantly hindered by financial limitations.

The front cover layout and suitable photographs posed a problem. After several months of experimentation, a somewhat flexible make-up was devised which has attracted favourable comment. Because the old block was worn out the opportunity was taken to try a new method. This appeared on the January 1973 cover. Bob Dorin, our photographer, would like to see more photographs submitted by readers, not only for the cover but also to brighten the inside pages. Large, glossy, clear prints with plenty of contrast are essential.

The internal layout, column headings, and presentation of the articles have been modified, improved, updated—all at no increase in cost. In fact, when it became necessary to replace the service column heading blocks, a considerable savings was made with the new style headings.

The appointment of a highly qualified Technical Editor has ensured the consistently high level of technical accuracy in the articles published, and Bill Rice has been of invaluable assistance to many authors.

In keeping with our policy, only a very few of the articles published in the past twelve months have been reprints from other publications, and then only after careful consideration of the possible benefit and interest to members. Preference has been given to previously unpublished articles from local contributors. But many more of these articles are needed.

The new feature columns, "Commercial Kinks" with Ron Fisher and "Newcomer's Notebook" with Rodney Champness, have proved to be very popular. The service columns presented by our regular Contributing Editors, Deane Blackman, Don Grantley and Eric Jamieson, and newcomers Peter Brown and Geoff Wilson, are providing an increasing valuable service to our members.

Because of the shortage of competent draftsmen, the preparation of circuit diagrams and line drawings has posed a problem to "A.R." for some time. We now have a willing and capable drafting team in Neil Osborne, John Adcock, and assistants Andrew Davis and Gordon Row. A comprehensive instruction sheet to assist in the standardisation of drawings has recently been completed by senior draftsman Ken Gillespie and supplied to all draftsmen.

In addition to some drafting and other duties, assistant editor Bruce Bathols converts the information received monthly from the Ionospheric Prediction Services Division into the numerical format which appears monthly in the magazine at a considerable savings compared to the earlier graph method of presentation.

No longer do Divisional Notes, generally of parochial interest only, appear in the pages of "A.R." In a successful endeavour to save money for themselves, and for the magazine, VK2, 4, 6 and 7 have ceased publication and mailing of their independent monthly bulletins and now supply their members with Divisional news via inserts in "A.R." Technical articles which previously appeared in the bulletins now appear in the pages of "A.R."

Despite all the efforts of the Publications Committee, the cost of producing "A.R." has escalated considerably, mainly due to increases in the price of paper and wages in the printing industry.

In a continued effort to find a suitable compromise between cost of production and lowering of standards, more of the content is unavoidably being printed in the smaller type known as 6 point.

Unable to obtain even a small increase from the Divisions in the members' subscriptions for the current financial year (presently 22 cents per copy, of which in excess of 7 cents is absorbed in the costs of wrapping, addressing and postage) we are searching for other ways in which to remain economically viable.

For many years "A.R." has been printed by the letterpress method. Five years ago an investigative committee decided that offset printing offered no financial advantages. Today could be a different matter.

The Publications Committee will continue to seek every possible way in which to keep the cost of publication down, **but without lowering of standards.**

And so to the second year . . .

Editor and Member of the Executive
W. E. J. ROPER, VK3ARZ.

OSCAR 6

Because of the failure of the 435.1 MHz. beacon, telemetry recovery from the satellite is now gathered through the 2 to 10 metre transponder. As telemetry data is required at regular intervals the repeater could be "on" for short periods during the week. If it is found to be on please do not use it mid-week. It will be on for general use from Friday to Sunday nights.

Latest DX titbit to hand. VK4 worked into KX6, Marshall Islands, early February, and KH6 was heard by ZL1 through the transponder.

G5UM, writing in "Rad. Comm." of Jan., comments that G4RH working across the Atlantic noted that "watery" signals from U.S.A. remained audible after Europe had dropped out and the predicted time of orbit had passed. This was attributed to the 29.5 MHz. signals bending or reflecting even though the satellite was beyond the radio horizon. Much the same was reported by G3COJ being heard by ZE7JX on Orbit 283.

OSCAR 8

Yes, Oscar 8, which is due for launch about mid-1974 has been re-named "Australis-Oscar 8" and is planned to be built wholly in Australia. It will carry a number of 144 to 435 MHz. experiments and, if sanction can be obtained, a 2.3 GHz. beacon. The planned life of this satellite will be three years.

MEMBERSHIP GRADES

You will have seen this year a small notation such as 2F, 3A, 5C, 7T on your subscription notice. This, as many will know, shows the Division and the membership grade recorded for yourself in the EDP records. It also helps the office when processing the payments. The State in which you reside governs your Divisional listing. Membership grades are F A C T S (plus L for Life or Honorary Members and X for sub-divisions). F and C respectively mean Full City and Full Country membership, A and T mean Associate City and Associate Country membership and S is a special grade to cater for students, pensioners and similar members for whom a standard subscription rate applies. Your ordinary membership grading is governed solely by your Divisional authorities. The details you see on your subscription notice and "A.R." mailing plate are the details passed on to the Executive office from Divisional offices or, in the case of name and address changes, are those which you have submitted direct to the Executive office or via your Division. Membership information sent direct to the Executive office is recorded and then on-forwarded to your Division because of a time lag in processing EDP print-outs.

BOOKS

A member now in the U.S.A. was a Marine in the Pacific area and is interested in Marines activities during W.W.2 in the Solomons. He would like to acquire a copy of a published Diary by W. J. Martin Clemens of his days as a coastwatcher in the Solomons. Does anyone know where a copy of this (out of print?) book can be obtained. If so please write to the Business Manager.

(Continued on Page 16)

A 30-40 MHz. FREQUENCY COUNTER

PART ONE

H. L. HEPBURN, VK3AFQ*

● In the last year or so the cost of integrated circuits of all types has, as they have been brought into ever increasing commercial use, dropped very significantly. Today a very wide selection of most complex devices cost little, if any, more than the humble transistor cost only four or five years ago. One effect of this price drop has been to make possible for the Amateur a range of equipment that was so recently but a pipe dream. The frequency meter now described comes into this category.

Those who use frequency counters in their day to day professional activities, or who have access to them for their Amateur activities, will need no convincing that they are most desirable (if not essential) instruments when there is a need for accurate frequency measurements.

Current Amateur activities such as s.s.t.v., r.t.t.y. and v.h.f. f.m. net operations all call for accurate measurements of frequency from low audio to high r.f. The modern digital frequency meter, such as that now described, does all this. That the Amateur fraternity all over the world realises the utility of the d.f.m. is evidenced by the number of articles appearing in Amateur literature in the past two years. Whilst no originality is claimed for the instrument which is the subject of this article, it does, at least, bring to the pages of "A.R." something which is relatively new, which is fully engineered and which can be built of parts readily obtainable in Australia. Construction is absurdly simple and requires not much more than the ability to handle a fine soldering iron.

The design presented is basically a 30 (plus) MHz. digital frequency meter which is optionally extensible to 200-300 MHz. It is based mainly on the 7400 series of TTL (transistor transistor logic) devices marketed by National, Fairchild, Motorola and Texas among others. Two ECL (emitter coupled logic) devices are used in the input circuits—one in the h.f. pre-amplifier and one in the (optional) v.h.f. prescaler. A single regulated 5-volt positive supply powers the complete instrument.

DESCRIPTION

Fig. 1 gives the general schematic of the instrument and also indicates the component groupings.

Either the output of the h.f. pre-amplifier or the output of the v.h.f. pre-scaler are selected electronically. In both cases the outputs consist of rectangular pulses in the 20 Hz. to 30 (plus) MHz. range. These pulse trains enter a signal gate which is "opened" for periods of time accurately determined by the control circuitry. Output of the signal gate is then passed to the indicating decades for counting and display.

The crystal clock—which determines the length and accuracy of the signal gate "opening" uses a 5 MHz. crystal oscillator whose output is divided first by 5 to give 1 m.p.p.s. (1 mega pulses per second) and then divided by 10 six times so that the final output of the clock is 1 pulse per second. Intermediate speeds are selectable. The selected crystal clock output (1 p.p.s., 1 k.p.p.s. or 1 m.p.p.s.) is used to activate the control circuitry whose function is to open and close the signal gate and, also, to generate strobing and re-set pulses for the indicator decades. A 9 volt, 3 amp. transformer, a bridge rectifier, smoothing capacitors and IC regulators provide the necessary power.

A detailed description of each function will now be given.

THE H.F. PRE-AMPLIFIER

The function of the h.f. pre-amplifier is to accept low level signals in the 20 Hz. to 30 (plus) MHz. range, to amplify them, to square them and to convert them to the steep sided positive-going pulses of relatively constant amplitude required to drive the rest of the logic circuitry.

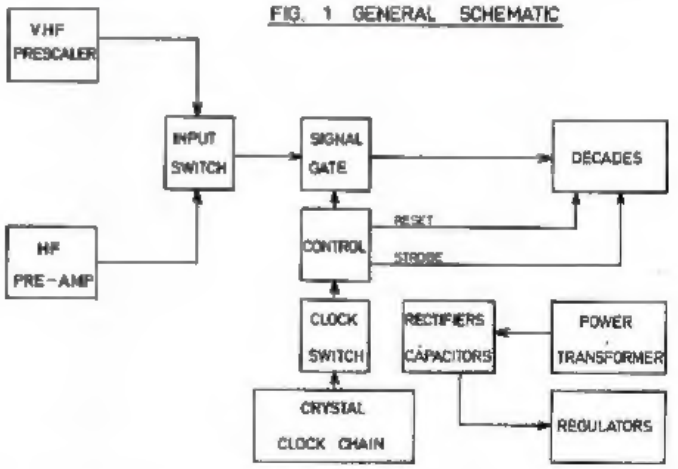
Another requirement of the h.f. pre-amp. is that its input sensitivity remains substantially constant over the whole frequency range to 30 (plus) MHz.

Within fairly wide limits the input waveform may depart from the ideal sine wave, but mixed waveforms (such as those from a two-tone test oscillator) will leave the instrument wondering which frequency it is supposed to be counting.

Fig. 2 gives the circuit diagram of the h.f. pre-amp. while Fig. 12 gives the component layout of both the h.f. and v.h.f. "front ends". A Motorola MC1035P triple line receiver is used to accept signals as low as 10 mV., to amplify them and to square them. The MC1035P is an ECL device so that its output is a train of negative-going pulses whose amplitude alternates between —0.8v. and —1.6v.

This output is unacceptable in both polarity and amplitude to the TTL logic used in the rest of the instrument and a BFY90 transistor and five 1N914 diodes are used to transform the ECL output of the MC1035 to the 3-4 volt positive-going pulses required by subsequent TTL logic.

FIG. 1 GENERAL SCHEMATIC



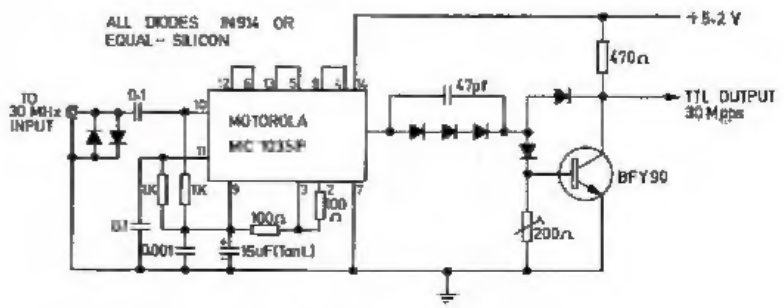


FIG. 2 HF FRONT END

*4 Elizabeth Street, East Brighton, Vic., 3187.

Two back-to-back 1N914 diodes are used to prevent overload of the MC1035P and the 200 ohm "Cermet" (Motorola type C2-1-1) pre-set pot in the BFY90 base is to adjust that transistor to its correct operating point. The resistors and capacitors associated with the MC1035 are used to provide the necessary bias and feed back voltages required by the device. For a more complete description of the internal circuitry and operation of the MC1035, the reader is referred to the Motorola MECL handbook. Note that the h.f. pre-amplifier is perfectly capable of functioning up to 70 MHz. so that any restriction on operating frequency will be in the subsequent TTL logic. More will be said of this in the appropriate sections.

Input impedance of the h.f. pre-amplifier is around 1000 ohms and sensitivity is around 5-10 mV. at 30 MHz. The sensitivity increases slightly at lower frequencies, but drops to around 20-30 mV. at 70 MHz. The p.c.b. measures 2½" x 1½".

In essence, the v.h.f. pre-scaler needs to perform exactly the same functions as the h.f. pre-amplifier but with one important addition. In the case of the h.f. pre-amplifier the repetition rate of the output pulse train is exactly the same as the frequency of the input signal. The v.h.f. pre-scaler is also called on to divide by 10 so that the repetition rate of the output pulse train is one-tenth of the input frequency. Fig. 3 gives the circuit diagram of the v.h.f. pre-scaler, while Fig. 12 gives the component layout.

A BFY90 is used to provide some measure of wide band pre-amplification, and is protected by back-to-back high speed silicon diodes at the input. Use of this amplifier raises the sensitvity of the unit at 200 MHz. from around 250 mV. to around 100 mV. More sophisticated and complex circuitry could have been used to increase this sensitivity even further, but was avoided in the interests of simplicity.

The heart of the v.h.f. pre-scaler is a Fairchild 95H90 high speed decade divider. Whilst quite expensive at around $16.00, it is, at the present time, the only freely available v.h.f. divider obtainable in this country. Like the MC1035, it is an ECL device so that, once again, there is a need to convert its output to be compatible with subsequent TTL logic. A 2N4258 is used to do this. Again the reader is referred to the manufacturer's data for the internal "workings" of the 95H90.

The chokes designated as "F29" are Neosid F29 tuning slugs with single wire through the centre. The RFC in the collector of the BFY90 amplifier consists of 8 turns of 26 gauge enamelled wire wound on a 5/32" drill shank and stretched to cover 5/8". Slightly heavier wire, say, 24 or 22 gauge, will do equally well, and may be easier to handle. The p.c.b. measures 2½" x 1½". Input impedance approximates to 50 ohms.

Whilst the inclusion of the v.h.f. pre-scaler is undoubtedly an asset in that it extends the frequency of operation to over 200 MHz., its use is by no means obligatory and may be omitted if the worth/price ratio is considered too high for any individual application. The most likely use for the pre-scaler in Australian Amateur circles will be to measure the output frequencies of 52 or 144 MHz. transmitters. The next band up in VK is 430 MHz.—a frequency not covered in any case by the pre-scaler.

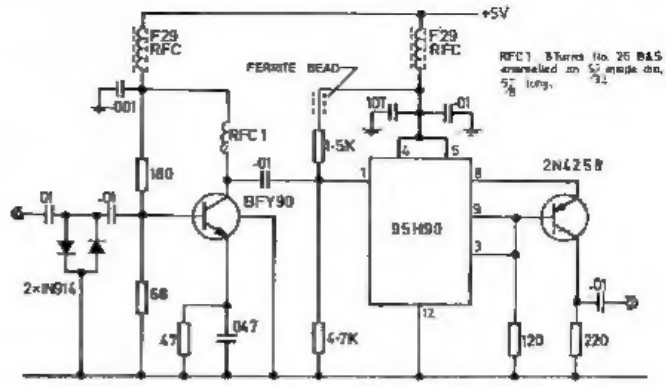


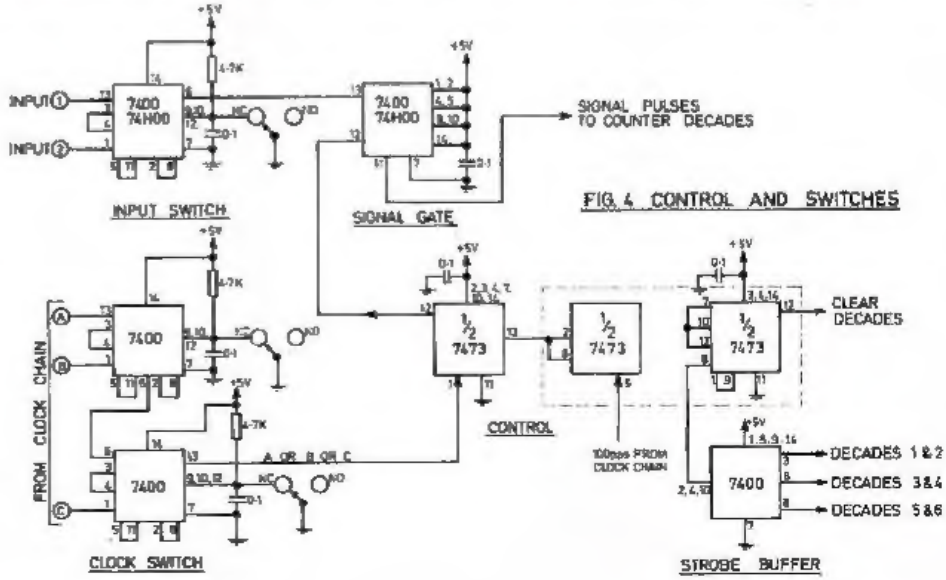
FIG. 3 VHF PRESCALER

With only a very minor loss in accuracy it is possible to use the h.f. pre-amplifier to determine v.h.f. output frequencies. Most current v.h.f. transmitter designs rely on generation of r.f. at a relatively low frequency (2-12 MHz.) and thereafter a series of multiplier stages raise this low frequency to the operating frequency. By selection of three ICs, it is possible to raise the maximum frequency of operation of the basic counter to in excess of 40 MHz. It therefore becomes feasible to measure the frequency of an appropriate multiplier in the unit under test and calculate accordingly. For example, the writer's d.f.m. is used in the "h.f." mode to set the operating frequency of the carphone described in the March and April 1971 issues of "A.R." This particular transmitter uses a 12 MHz. crystal and triples in the collector circuit of the oscillator. Thus, if setting this transmitter to Channel B on 146.00 MHz., the output from the oscillator is set to exactly 36.500 MHz., then the output will be very close to the required 146.00 MHz. Just how close it can be made is indicated later in the article. Similarly, other sub-multiples of receiver oscillators or transmitter oscillators can be measured in order to determine end use frequencies.

THE INPUT SWITCH

Reference to Fig. 3 shows that either a 7400 or a 74H00 may be used as an input switch. Both devices are quad 2 input NAND gates differing only in their maximum operating frequency. For operation up to 30 MHz. the 7400 is adequate, whilst the 74H00 is recommended for operation in excess of 30 MHz. Note that the input switch is not required if the v.h.f. pre-scaler is not used. In this case the IC is not put on the main p.c.b. (see Fig. 11 for layout) and pins 3 and 13 are joined by a wire link. For operation of this switch (and the crystal clock switches), the reader is referred to Fig. 8.

The "Truth Table" shown in Fig. 8 refers to the various voltages that can be found on the output of any single gate (there are four such gates in a 7400 or 74H00) for any of the four possible combinations of voltages on the two inputs. Note that, in this context, we are only interested to know if the input voltages are **"high"** or **"low"**, i.e. are 3-4 volts **(high)** or under 0.3 volt **(low)**. Intermediate voltages are neither desirable or correct. Start with the assumption that both inputs



X and Y are pulsing **high**—that is two input signals are presented to the four gate switch.

Further assume that the points B. D and E are held **low** by the earthing switch.

If point B is held **low** and point A pulses between **high** and **low** at the frequency of input X, then there will be no change in the voltage at point C. The truth table shows that no matter whether A and B are both **low** or one is **high**, and one is **low**, point C will remain **high**. In other words, the pulsing of input X will **not** appear at point C for transfer to point L. On the other hand, however, since both points D and E are held **low**, then points F and G must be held **high**. If this is so, input Y (which is pulsing between **high** and **low**), will cause points K and M to alternate between **high** and **low**. In effect, the pulse trains from input Y are being passed on to point M.

Since point L is held high and point M is alternating between **high** and **low**, then the output point N will alternate between **high** and **low** at the same frequency as input Y.

If now points D, E and B are made **high** by opening the earthing switch, then the opposite applies.

Input Y is blocked off and only input X appears at output point N.

We have thus achieved the selection of one of two high frequency inputs by using only simple d.c. switching. This method avoids r.f. selection by means of a front panel switch and its associated co-axial links. The method used is only marginally more expensive and, functionally speaking, much more efficient.

THE SIGNAL GATE

The function of the signal gate is a very simple one. At the command of the control unit it must either **open** and pass its input to its output, or it must **close** and not allow its input to appear at its output.

It must do this at the maximum frequency of operation desired, and it must do so for the precise periods determined by the crystal clock and control unit. Fig. 1 shows its logical position, while Fig. 4 shows its circuitry.

One gate only of a 7400 or 74H00 four-gate IC is used. As in the discussion under Input Switch, the maximum frequency of operation is determined by the type chosen. It is strongly recommended that a 74H00 be used to extend the operating frequency of the basic counter to at least 40 MHz.

Operation of the signal gate is covered by the "Truth Table" of Fig. 8. If one (control) input is held **high** by the control circuitry and the other (signal) input is pulsing between **high** and **low**, then the signal gate output will also pulse between **high** and **low**. The signal input pulse train is thus passed on for counting.

If, on the other hand, the control circuits hold the control input **low**, then no matter if the signal input is **high** or **low** the signal gate output will remain **high**. The pulse train at the signal input will thus not be passed on for counting.

THE CRYSTAL CLOCK

If the control section of the counter can be described as its "brains", then the crystal clock can aptly be described as its "heart". The function of the crystal clock is to provide pulses, of high accuracy with respect to time, to activate the control circuits. The accuracy of the counter will be that of the crystal clock.

Let it be assumed that a signal of precisely 10 MHz. is being measured. Let it be further assumed that the signal gate is to be opened for one second. 10 million pulses will thus be passed on to the indicator decades for counting.

If the accuracy of this one-second control interval is plus or minus 1 part in 1 million (10^6) the number of pulses passed on for counting will be in the range 9,999,990 to 10,000,010—that is an error of plus or minus 10 pulses. If the accuracy of the crystal clock is plus or minus 1 part in 10 million (10^7) the accuracy will be plus or minus 1 pulse. If the accuracy of the crystal clock is only plus or minus 1 part in 100,000 (10^5) then the count accuracy will only be plus or minus 100 pulses.

For highest accuracy the writer beats the 75th harmonic of the 100 k.p.p.s. output from the crystal divider chain against VNG at Lyndhurst, Victoria, on 7.5 MHz. The accuracy of the calibration is to within 1 Hz. at 7.5 MHz. or, say, 20 Hz. in the 2 metre band.

Fig. 5 gives the circuit diagram of the crystal clock, while Fig. 11 gives the component layout.

A Hy-Q 5.000 MHz. type Delta GF series resonant crystal is used in conjunction with a 74H00 NAND gate. Output from the 74H00 is a series of positive-going rectangular pulses with a repetition frequency of 5×10^6 pulses per second. Adjustment to precise frequency is by means of the 9 pF. trimmer in series with the crystal.

Note that the circuit is **not** suitable for crystals calibrated for use in parallel circuits.

Division down to 1 pulse per second is done by a series of 7490 decade dividers. The 7490 (whose flexibility can be seen if the maker's data is examined) is basically a bi-quinary divider. That is, it can divide by 2 or it can divide by 5, or it can divide by $2 \times 5 = 10$, depending on the way it is connected.

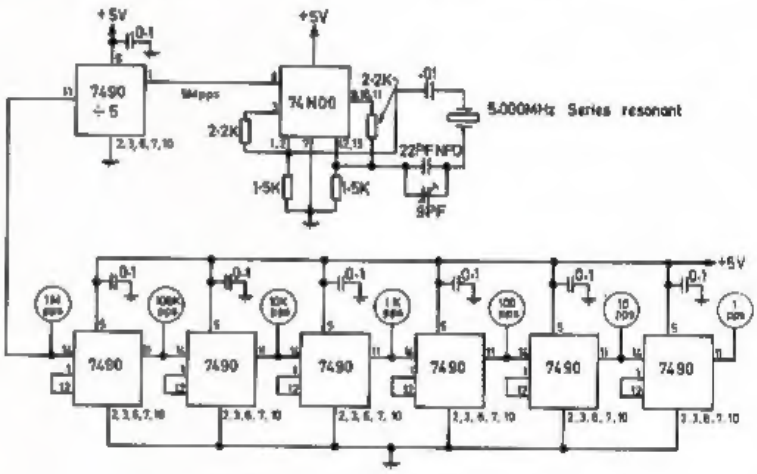


FIG. 5. CRYSTAL OSCILLATOR AND CLOCK DRIVERS

It follows, therefore, that the higher the frequency at which the clocking pulses are generated and the more stable the oscillator can be made, the higher will be the overall accuracy of the counter. In the design now presented, the generation frequency is 5.000 MHz., this being the current optimum of cost versus frequency so far as the crystal is concerned.

Whilst crystal ovens are used in professional equipment they are both expensive and not easy to obtain. A little thought will lead to the conclusion that for Amateur purposes such ovens are an unnecessary expense.

Provided that the crystal used is capable of being adjusted only a small fraction of a percent. either side of its nominal frequency, or, to be more precise, capable of being adjusted exactly on to frequency, then for the short periods of time needed to carry out accurate frequency determinations, the crystal can be adjusted to zero beat with WWV on 15 MHz. or VNG on 7.5 MHz., or any strong local frequency standard.

In this design a 7490 is used as a divide by 5 to bring the oscillator output down to 1 m.p.p.s. and then a further series of six 7490s connected as divide by 10s are used to bring the final output to 1 p.p.s. Access is made available at each divider output so that signals having pulse repetition rates of 1.0 m.p.p.s., 100 k.p.p.s., 10 k.p.p.s., 1 k.p.p.s., 100 p.p.s., 10 p.p.s. and 1 p.p.s. can be used. On the writer's instrument

(Continued on Page 11)

Output (p.p.s.)	Equivalent Time Interval (Seconds)
1 p.p.s.	1.00
10 p.p.s.	0.10
100 p.p.s.	0.01
1 k.p.p.s.	0.001 (1 millisecond)
10 k.p.p.s.	0.0001
100 k.p.p.s.	0.00001
1 m.p.p.s.	0.000001 (1 microsecond)

Table 1.

MOBILE WHIP CONSTRUCTION DETAILS

DOUG. PANNELL,* VK6EP, VK6SP/Mobile

• The author has had many requests for details of the techniques he has used with success in constructing mobile helical whip antennas. He has now provided the information in this article so that all who are interested in building their own mobile antennas may benefit from his experience.

This information applies to the whips at present in use. Details may vary somewhat from car to car, but the fundamental requirement is that the antenna must be resonated on its operating frequency by monitoring that frequency whilst energising with a grid dip oscillator (via a link at the antenna base).

All the whips are wound on standard 6-foot solid fibre glass fishing rod blanks. Start with a spool of tough enamelled wire in excess of ¼ wavelength long, as listed in Table 1.

Set up a winding area, preferably clamping a large hand drill in a vyce and providing a rest (or steady) for the rod. A stand for the wire spool should be about five feet away and allow for the four feet travel (the length of the longest winding) with ease.

Fit the sleeve and apply a quantity of Loctite to the base and sleeve bore. Tap the sleeve on until the ends are flush and add more Loctite as it wicks down. Set aside for the chemical action to occur. While waiting, measure the rod and make marks with a ballpoint at the winding terminations. Mark up the extra 3" for the braid tip, obtain a length of braid from a similar sized co-ax., clean the enamel from an inch of wire, wrap several strands of the braid around the wire and carefully solder, remembering that the braid has to be stretched and cemented in place. This can now be done.

The wire could be soldered after attaching the braid, but fibre glass is susceptible to heat and if the braid is fastened to the rod before soldering the resultant burning of the rod may cause embrittlement and fracture, so be careful.

Before commencing winding, attach several 2" lengths of masking tape to a convenient edge for quick accessibility. Secure the assistance of a friend (even an XYL). Pip the rod top off above the 3" length of braid, after the cement has set and fit it in the drill chuck. Set up the steady just beyond the end of the close wound mark, adjust the position of the spool stand, wrap two turns of masking tape around the braid to support the soldered joint, and with a glove or soft clamp to hold and guide the wire, commence winding. Allow the wire to roll on between the fingers for the first few turns, gradually applying more pressure and letting the wire roll hard against the preceding turn. If trouble develops, wrap a turn of tape on quickly.

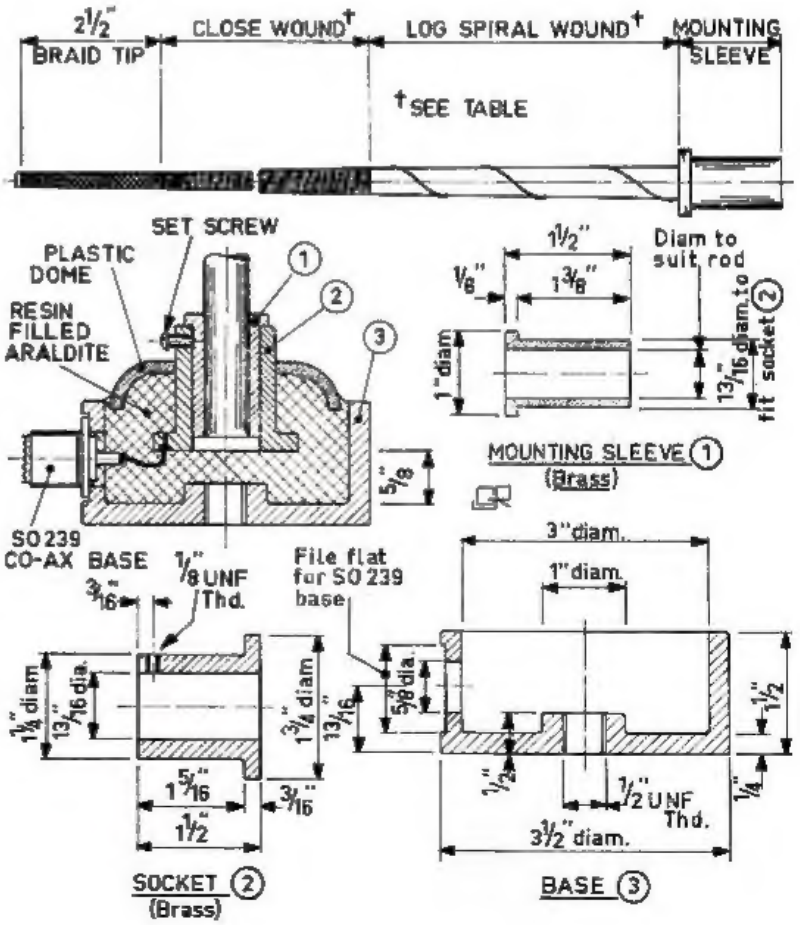
Wrap the termination of the winding with two wide-spaced turns of tape forming a guide through which the wire is pulled to remove turns. Remove from the chuck after wrapping a few wide spaced turns down to the sleeve and adding a turn of tape. Fit the sleeve in the mount, which preferably is on the sunvisor or a bar over the roof, and lay the spool on the roof. Scrape a small spot on the wire, attach a one-turn link with clips at each end to the bare copper and an adjacent earth, set an accurate monitor to the desired centre frequency and check the resonance with a g.d.o. Turns may be added or removed readily, providing that care is exercised in baring the copper.

Dip the whip to the monitor in a place free from frequency pulling effects, such as resonant overhead antennas, guy or fencing wires, poles or

(Continued on Page 11)

Freq. MHz.	Wire Mils.	Radius Mils. Base	Radius Mils. Top	Winding Inches C.W.	Winding Inches Spac.	Winding Turns C.W.	Winding Turns Spac.	Wire Ft.	Wire Ins.	Wire Av. T.P.I.	¾λ Ft.
3.6	22.6	380	130	53	9	2332	4	175	11	44	205
3.6	28.5	560	175	48	14½	1728	4	193	17	36	205
7.07	27.5	380	145	38½	24¼	1386	11	104	28½	36	104
14.2	27.5	366	180	24½	31½	882	9	41	35	36	52
21.3	27.5	380	145	13⅜	49	477	10	24	51	36	35
28.4	27.5	380	140	9½	55	346	11	16	57	36	26
52.6	27.5	183	95	3½	35	117	16	3	37½	36	14

Table 1.



* 20 Hare Street, Kalgoorlie, W.A., 6430.

NEWCOMER'S NOTEBOOK

With Rodney Champness,* VK3UG

LEARNING MORSE CODE, Part 2a

Sending—The Morse Key

Without a good quality key it is difficult and frustrating trying to send good Morse. The so-called cheap "beginner's" key is to be avoided like the plague. They are toys for all intents and purposes.

The key chosen should not be too small, either in length of arm or size of knob. It should have an adjustable back contact (this sets the contact clearance), and an adjustable spring (this sets the pressure necessary to close the contacts). There should be no discernible sideways movement or vertical movement when the key is closed, as this is disconcerting to the sender and can cause alteration of both the spring tension and contact gap. Most good keys will have "tipped" contacts.

Typical sources of suitable keys are disposals stores. Occasionally some advertisers in "Amateur Radio" do have suitable keys. A very good key is advertised in our sister magazine "Break-In". The disposals stores often have ex-service keys and some of these are quite good, notably the ex-Army keys. The Air Force flame-proof keys usually lack one or more of the desirable qualities listed above. Don't be satisfied with a key that is below par.

Would you like to build your own key– If so, I cannot do more than recommend that you consult the following articles in "Amateur Radio": "A Drop of Home-Brew", Feb. 1972, by VK3AXU; "After Thoughts," April 1972, VK3AXU; and "More on Morse Keys," October 1972, VK5TL.

Having obtained your key it will then need to be adjusted. The contacts should be adjusted to give a clearance of 1/32" to 1/16", with appreciable tension on the spring. This adjustment is suitable for the raw beginner at low speeds. As proficiency is attained, the spring tension is gradually reduced to the point where only enough tension is exerted to return the key smartly to the rest position. At the same time the contact gap is reduced to the thickness of good writing paper. This setting is suitable for the accomplished operator and is satisfactory for speeds of 25 to 35 w.p.m.; this depends on how supple your wrist is.

Next month: Part 2b, Audio Monitor Circuits. ●

* 44 Rathmullen Road, Boronia, Vic., 3155.

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THE HISTORICAL DEVELOPMENT OF U.H.F. CIRCUIT TECHNIQUES

PART THREE

ROGER LENNED HARRISON, VK2ZTB (ex VK3ZRY)*

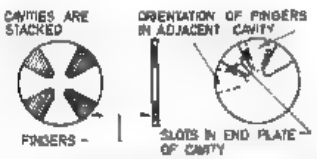
1945 TO 1955: SOLID STATE DEVICES, TRAVELLING WAVE TUBES AND EARLY MASERS

Travelling Wave Tubes. In 1947, Rudolf Kompfner published the results of his work on travelling wave amplifiers. During the latter years, and after the war, these were developed into a commercially practicable device. From the original device that worked near 3000 MHz., working models were pushed ever higher in frequency; leap-frogging right up to 48 GHz. and 55 GHz.

To obtain various results and to broaden the applications of travelling wave tubes, the basic helix slow wave structure (Fig. 27) had to be altered or different structures designed. This necessitated different structures for high power—wideband or low noise—wideband operation. Figs. 28, 29 and 30 illustrate various slow-wave structures designed and incorporated into travelling wave tubes. The ring and bar structure has broad bandwidth and is capable of tens of kilowatts peak power. The clover leaf has only medium bandwidth but is capable of high c.w. power and the Karp structure is suitable for narrow bandwidth, low power, high frequency use.

FIG. 28

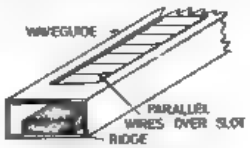
In the above-mentioned devices the phase velocity of the wave mode is in the same direction as the electron stream and thus they are called **forward wave devices.** Sometime between 1950 and 1955, **backward wave devices** were developed. The phase velocity of the wave mode along the slow wave structure being in the opposite direction to the electron stream. These devices are used mainly as oscillators.[13]



THE CLOVER LEAF STRUCTURE FIG 29

Solid State Devices. In 1948 **Bardeen** and **Brattain** (Bell Telephone labs.) succeeded in making the first decisive steps towards the transistor while working on the germanium detector. The point-contact detector had been used in the very early days of "wireless" but was soon replaced by the vacuum tube. However, in 1936, Mr. Ohl (Bell labs.) researched the properties of silicon and improved the microwave diode detector. This sparked off research into germanium which Bardeen and Brattain took up in 1942.

The invention of the transistor is officially credited to John Bardeen, William Shockley and W. Brattain from the Bell Telephone laboratories. The first public announcement of the transistor was made in June 1948.



THE KARP SLOW-WAVE FIG. 30

Many solid state devices emerged around this time. In Germany, technical development in the Siemens plant led to the germanium detector whereas the Telefunken laboratories created a silicon detector for centimetre waves based on research into silicon.

Similar developments took place in England and the U.S.A. quite independent of the German efforts.

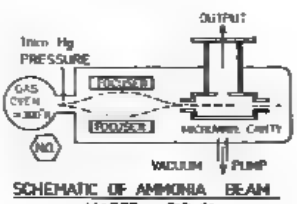
Masers. The first operating **maser** was constructed by J. P. Gordon, C. H. Townes and H. J. Zeiger at Columbia University. The device was wholly conceived, designed and developed by them and first worked in 1954. They coined the term Maser which stands for "Microwave Amplification by the Stimulated Emission of Radiation". I quote here from Ref. 14:

". . . The material utilised was an ammonia gas beam that had its upper state molecules separated from the lower state molecules by an electrostatic field. The excited molecules passed through a microwave cavity of the appropriate frequency (about 24 GHz.) and amplification or oscillation could then be accomplished. Since the operating frequency is established by the nature of the ammonia molecule, there is no provision for tuning. Therefore the major application of the ammonia beam maser is as a 'clock' or frequency standard".

As the principles of operation of masers became understood, other schemes were proposed and tried. In 1956, Bloembergen of Harvard University suggested the use of paramagnetic solids in molecular amplifiers. This was later put into practice.

An illustration (diagrammatic form) of an ammonia gas maser is given in Fig. 31.

The decade following the war appears to have been a period in which devices first constructed during the war were further refined. It also appears to have been a period in which research into fundamental physics turned up several very useful u.h.f. devices. These new devices appeared to be highly radical at first but later developments enabled them to solve many problems that had beset engineers and scientists working in many fields.

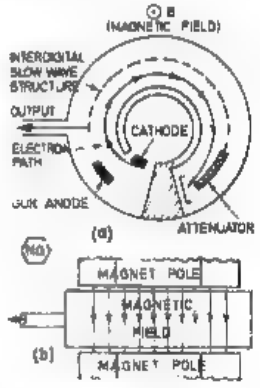


SCHEMATIC OF AMMONIA BEAM MASER FIG. 31

1955 TO 1965: SOLID STATE DEVICES EXPAND INTO U.H.F.; MASERS AND TRAVELLING WAVE DEVICES FURTHER DEVELOPED

In this decade, several fundamentally new devices and techniques were developed which changed the approach to then current problems, providing much improved, if not radical, solutions. These developments assisted, and were assisted by, the arrival on the scene of artificial earth satellites in 1957 (Sputnik I.). A general expansion of communications into u.h.f. during this decade also added impetus to developments.

The Solid State Maser (a). In 1956, Bloembergen, at Harvard University, suggested the use of paramagnetic solids in molecular amplifiers.[14] Later that year a solid state maser was successfully operated by Scovil, Feher and Seidal using lanthanum ethysulphate crystal. The device was mainly constructed to establish the feasibility of Bloembergen's proposal. The principle was later adapted for use at millimetric wavelengths (30 GHz. to 60 GHz.).



THE CARCINOTRON FIG. 32

The Carcinotron. Also in 1956, both in Britain and America, the "carcinotron" or backward wave oscillator appeared as a practical working device. An illustration is given in Fig. 32.[15] The backward wave principle had been proposed before but the carcinotron was the result of research into the idea.

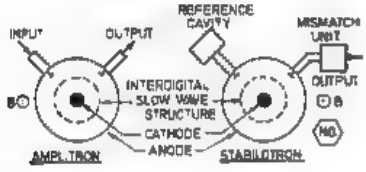
The Platinotron. Another travelling wave device appeared in 1957. It was called the "Platinotron" and was the result of research into the magnetron.

* P.O. Box 702, Darlinghurst, N.S.W., 2010.

It is a device intermediate between magnetrons and carcinotrons (see Fig. 33). It can be used as an amplifier or an oscillator. As an amplifier, the input and output are match loaded whereas in the oscillator an external reference cavity and a mismatched load are used.

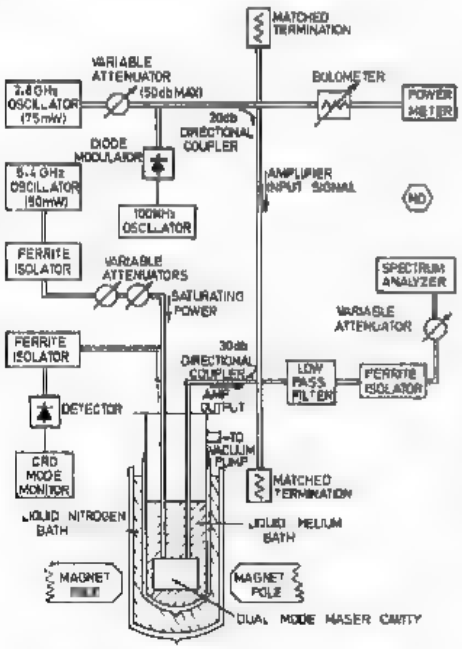
A typical device is capable of the following performance: 10% bandwidth, 50-70% efficiency, 10 dB. gain for high drive level, 20 dB. gain for low drive level. The frequency of operation depends on external circuitry.

As an external cavity is used with the oscillator, the stability is greater than that of a magnetron, often approaching 100 times the stability.[15]



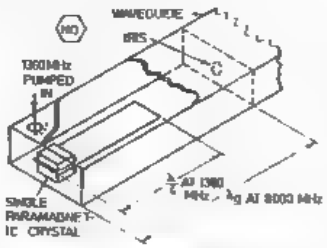
PLATINOTRONS FIG. 33

Solid State Maser (b). Between 1956 and 1958 much research was carried out concerning maser operation. In 1958, several groups published the results of their work and details of working devices. In America, McWhorter and Meyer; Artman, Bloembergen and Shapiro; and Morris, Kyhl and Strandberg were three groups to successfully operate solid state masers. In Europe, Markhov, Kikuchi, Lambe and Terhune achieved similar results. Illustrations are given in **Figs. 34, 35 and 36.**[16]

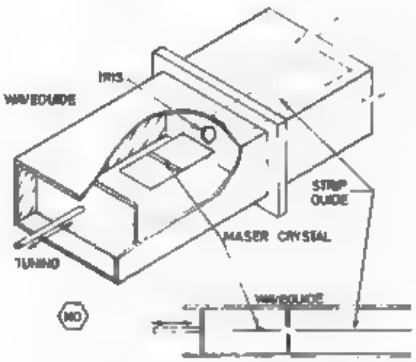


BLOCK DIAGRAM OF A THREE LEVEL MASER (McWHORTER & MEYER) FIG. 34

The Adler Tube (a). In 1958, H. J. Adler (in America) constructed an electron tube for low noise amplification. It utilised the cyclotron wave motion of an electron beam to achieve parametric amplification. The original device worked at 400 MHz. (see Fig. 37). Performance figures for the device were as follows: gain 20 dB., noise figure less than 1 dB.[16] The device was subsequently improved. It possesses the advantages of very low noise amplification, and a frequency independent amplifying mechanism.

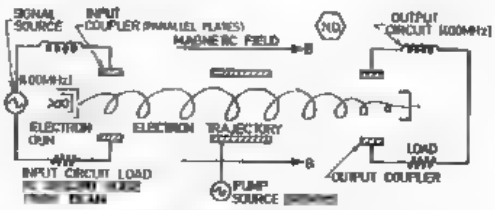


THREE LEVEL MASER CAVITY BY ARTMEN, BLOEMBERGEN & SHAPIRO FIG. 35



THREE LEVEL MASER CAVITIES (SCOVIL, FEHER & SEIDEL) FIG. 36

The Varactor Diode (a). In 1936 when R. S. Ohl developed the silicon crystal detector it was found that the diode terminal capacitance varied with impressed voltage—and varied in a non-linear fashion. This property, which is found in all diodes, was regarded as a nuisance for many years until the idea of parametric amplification and frequency multiplication using variable reactance devices was propounded and eventually accepted. Special varactor diodes were developed during 1956 and 1957 which exhibited the characteristics desired.



400MHz ADLER TUBE - FIG. 37

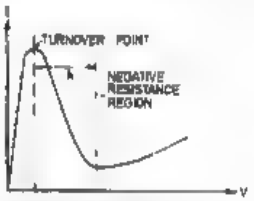
Parametric Devices. It appears that 1958 was the year for parametric amplification. Several theoretical works on "pumped" or parametric oscillations had appeared from as early as 1860. A device using non-linear reactance as the main element had been earlier suggested and one of the first working parametric amplifiers to incorporate a varactor diode was built by Sam Harris (W1FZJ) and described in the November issue of "CQ Magazine".

Parametric amplifiers are now very common, especially in satellite communications systems. The performance of these amplifiers is little short of the ultimate! At 1000 MHz., noise figures of 0.8 dB. can be achieved with a gain of 25 dB. and a 5% bandwidth. It has the disadvantages of drift problems and the difficulty of setting it up for stable operation

Parametric mixers with low noise and high gain have also been developed utilising the parametric principle

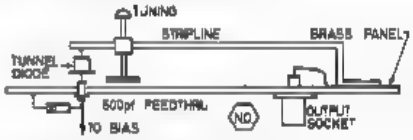
The Tunnel Diode. In October 1958 a radically new device, a diode, possessing negative resistance characteristics, was announced. It was called the "Esaki" Diode" (after its inventor) or the "Tunnel Diode" (after its operation)

A Japanese physicist, Esaki, discovered that if a diode junction was heavily doped with certain impurities then its forward conduction characteristics are drastically altered. The current/voltage curve exhibited a negative conduction region as shown in **Fig. 38.**



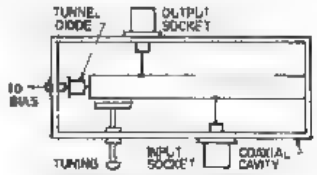
TUNNEL DIODE I/V CHARACTERISTICS FIG. 38

This property of the diode can be used to provide amplification, oscillation or regenerative flip-flop operations. Three typical circuits are illustrated in **Fig. 39 (a), (b), (c).**

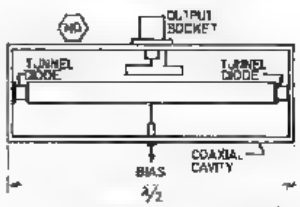


400MHz STRIPLINE OSCILLATOR FIG. 39(a)

Travelling Wave Maser. In 1959, travelling wave devices again took a step ahead with the production of the travelling wave maser. This device utilised the principle of interaction between an active medium and a travelling wave (see Fig. 40). Performance at 19 GHz. was: 23 dB. forward gain, 25 MHz. bandwidth, 0.18 dB. noise

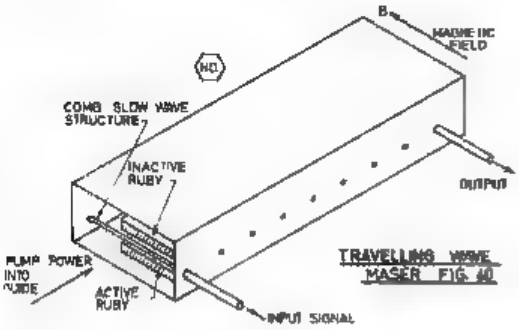


400MHz COAXIAL AMPLIFIER FIG 39(b)



5.6Hz OSCILLATOR FIG. 39(c)

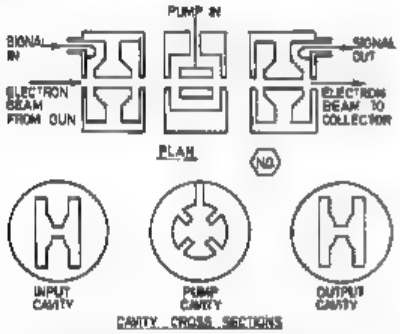
figure, and 100 mW. pump power. It was immersed in liquid helium to cool it for proper operation as with ordinary masers.



TRAVELLING WAVE MASER FIG. 40

Ferromagnetic Devices. Ferromagnetic devices were being widely investigated during this decade, and many useful properties (such as the ability to rotate the fields inside a waveguide) were uncovered. Ferromagnetics subsequently came into widespread use as attenuator components, dummy load components, field rotating components, etc.

The Microwave Adler Tube. In March 1960, Bridges and Askin published details of a microwave Adler tube.[16] An illustration is given in Fig. 41, and performance figures were as follows: gain 25 dB., noise figure approx. 0.8 dB., and pump power 1 watt at 8274 MHz. Signal frequency was 4137 MHz. The device was subsequently improved later the same year.

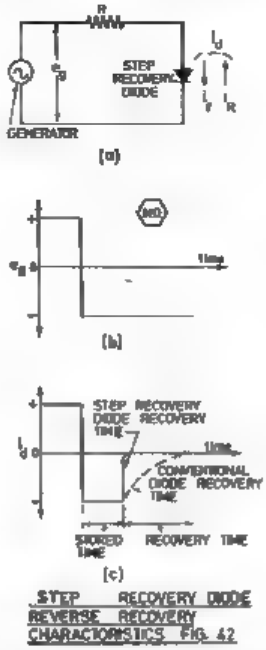


MICROWAVE ADLER TUBE FIG. 41

The Step-Recovery Diode. In 1961 the step-recovery diode was announced. This device was the result of research into fast-switching diodes. The device was subsequently recognised to have very desirable properties for u.h.f. circuits, particularly frequency multiplying. Fig. 42 illustrates its characteristics as against a conventional diode.

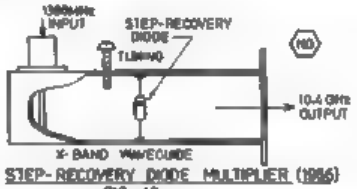
In the ensuing years these properties were investigated and it was found that these devices would multiply quite well by odd orders, i.e. 17 times. High orders of multiplication with good efficiency were obtainable also—typical being 80 times or more. A device multiplying from 1300 MHz. to 10 GHz. is shown in Fig. 43.

The device was constructed by an Australian Amateur, power output being in the region of 50 mW. for approx. 1 watt drive power. Step-recovery diodes are also known as "snap-diodes".



STEP RECOVERY DIODE REVERSE RECOVERY CHARACTERISTICS FIG. 42

This decade appears to have been one of rapid development and application of theoretical proposals put forward, and the further development of existing techniques.



STEP-RECOVERY DIODE MULTIPLIER (1966) FIG. 43

The introduction of solid state techniques has greatly simplified techniques employed in the u.h.f. spectrum and solved many problems that had arisen with the increased sophistication of communications equipment. This trend appears to be continuing at an ever increasing rate. ●

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FREQUENCY COUNTER

(Continued from Page 8)

the 1 m.p.p.s. and 100 k.p.p.s. outputs are permanently wired to two BNC co-axial sockets on the back of the cabinet for external calibration work.

It may assist readers to transform these outputs into terms of time. Table 1 does this.

Selection of the time interval to be used to activate the control circuits is by means of two 7400 switches. These operate in exactly the same way as those described under Input Switch. Their circuitry is given in Fig. 4, whilst the layout is given in Fig. 11. Using two 7400s, any one of three inputs are selectable. The board is laid so that at all times the 1 k.p.p.s. (0.001 second) and 1 p.p.s. (1.00 second) inputs are available, whilst the third input (probably 1 m.p.p.s.) can be wired in if desired. It is worthy of note that the use of two more ICs (a third 7400 and a 7430) would enable any one of six timing periods to be selected.

Interested readers are referred to "Radio Communication" of August 1971 for further detail. However, these extra timing periods were not deemed necessary (or found necessary in practice) and so were not included. ●

☆

MOBILE WHIP

(Continued from Page 7)

overhead shielding, feeders, etc. Should multiple dips be in evidence, the winding is much too long and a considerable number of feet can be removed. Be very wary about s.w.r. as this antenna, complete with its image, is equivalent to three collinear half waves in phase centre fed and each half wave has its own s.w.r., therefore you have three standing waves and two of them have end effect shortening while the centre one is fed, so stick with absolute resonance and be wary about pruning the braid on top.

Due to the length of winding and the collinear effect, there is a gain factor over a wound quarter-wavelength. Tests have shown several "S" points between the 1/2 and 3/2 wavelength whips checked over two to ten thousand mile ranges. Serious reading of A.R.R.L. Antenna Handbook chapter two is recommended as it will open the way to an understanding of image as well as physical antennas, their harmonic operation, lobe angle, feed impedance, etc.

Having resonated the whip, possibly had a look at the s.w.r., cut the spool free and carefully solder the bared end to the sleeve, now fire it up on a distant operator and check it out. Don't get it damp because it will become non-resonant and have to be dried out. When you have it to your satisfaction and dry, spread out the spaced winding, fix with small strips of masking tape and apply a liberal coating of Plastacoat 33. This does not affect the resonance but leaves a pleasing effect, a real finishing touch. Don't forget to have some Plastacoat Thinners on hand as it cleans off the brush, hands and splashes; turps won't. ●

AMATEUR RADIO—THE PRESERVATION OF ITS RIGHT TO OPERATE

T. R. CLARKSON, ZL2AZ

● ZL2AZ was a member of the I.A.R.U. team at the 1971 Space Conference. His comments on the existence and the future of the Amateur Service apply not only to Region 3 but throughout the world. No apologies are needed for re-printing this article from I.A.R.U. Region 1 News of December 1972.

PRESENT SIGNIFICANCE

Radio Amateurs operating today commenced their operations in an era of stability, as regards their right to operate. Even in the early days, half a century ago, there were rules and regulations, and within them there was scope for what Amateurs wanted to do and were able to do, at that time. Later, things expanded and became more complicated, but the general framework was the same, reasonable opportunities with official approval and encouragement. There naturally developed a kind of trusting attitude, a general belief among Amateurs that things would go along satisfactorily, and that Amateur operations would continue into the indefinite future.

This happy state of mind is engendered by the slowness of the controlling changes which can alter the general situation, and the remoteness of influence that may be at work to our disadvantage. We may be all right today, and next year—but there is not the slightest doubt that every five to ten years decisions are made which shape this subject of ours, a relentless control, on which the more distant future of Amateur Radio is directly dependent. The structure of our present subject was mainly identified with decisions made at Washington in 1927 and at Cairo in 1938—Amateur Radio for the rest of this century at least, will stand or fall, grow or decline, in terms of what is done in this present decade.

So my remarks are to draw attention to the present situation, and make some suggestions as to how we should safeguard our interests. First I should emphasise the need, and special opportunity at this time. Things have changed in the world of radio since the last major changes in operating conditions were introduced in 1947—demands by other services have increased, and so have Amateur ambitions.

The ionospheric era has declined, with the ascendency of space, and rules and practices prior to space technique are out-dated, with v.h.f. and higher frequencies being pre-eminent now. Changes in the world at large act to our detriment. At Atlantic City 1947 policies were pushed through by the radio advanced nations, who had an enlightened self-interest in Amateur Radio prosperity.

But now the international influence of less developed nations is discernible as opposing proper Amateur Radio development. The special message of the Space Radio Conference at Geneva in 1971 was that "in the world today, there is no majority opinion favourable towards the advancement of the Amateur Service". Individual and corporate action is needed to remove Amateur Radio from its position of weakness.

WHAT OUR NEEDS ARE

My remarks will conform to the principle adopted in international and national regulations that Amateur Radio constitutes a "radio service" in which the participants have motives only of personal interest, and no pecuniary purpose.

We know of the many compelling reasons that justify Amateur Radio, in the community, the nation, and the world, and they are excellently documented in our literature (e.g. Stanford Institute Research Report). Sometimes there is insufficient attention given to the "superior" position of Amateurs compared with other radio work by virtue of its being "voluntary". Its unique character arises from spontaneous motivation in the individual—the urge to communicate, with similarly imbued fellows, using skills and resources within their sole proprietorship.

When practising this kind of self-expression there are numerous desirable secondary products, community value, self training, research and development, etc., which are the obvious justification for a nation to support its Amateur Radio. The essentially personal nature of our thoughts and actions entitle them to recognition as a human right, which should not be denied by others. Nevertheless, practical politics bring the secondary effects into prominence, and for the present at least our welfare has to be thought of in the pattern of existing kinds of regulations.

Amateur Radio needs the opportunity to use representative parts of the radio frequency spectrum. But in general the parts for practical use are those where equipment limitations do not prevent individual ownership and operation.

Radio communications use frequencies as low as 14 kHz., but throughout its ascendency Amateur Radio has used frequencies higher than 1500 kHz. I am not aware that there has ever been a need expressed for Amateur transmissions at say 100 kHz. So there has been adequate scope for Amateurs in the higher part of the spectrum, and this has exploited the v.h.f. and higher bands. Now very much higher frequencies are coming into use for various services and the international regulations foresee allocations as high as 275 GHz. There is provision for Amateur work in bands extending up to 24 GHz.

During the next few years services will be making claims to get future assignments in the higher gigahertz part of the spectrum. Many of the needs are for intercommunication in space beyond earth's atmosphere and other earthly effects. The question will come up as to whether the Amateur Service should seek allocations for the future at frequencies above 24 GHz.

Present technical approaches to communications in space involve plant and equipment far removed in nature from the modest resources of Amateurs giving satisfactory scope for earth-bound activities. Beyond the realm of the geostationary orbit radio intercommunications seem to fall outside normal Amateur aspirations. So the very high part of the spectrum seems to be of little practical interest, the same as the very low part.

These considerations lead to the idea that **Amateurs need access to parts of the spectrum, say, between 1500 kHz. and 24 GHz.**, that is where techniques are attractive for operating individual links of communications. Amateurs should be free to explore parts of this spectrum having different characteristics, using both earth and space techniques. What I am suggesting is that we should concentrate our interests primarily to earth-bound links, but using space techniques to distances as far as the geo-stationary orbit. Those of our fraternity who wish to extend their interests further out in space may well find scope in some other radio service, for example radio astronomy.

By defining our interests to a part of the total spectrum, we should be able to strengthen the claims we have for it. We should also concentrate on having access, to operate, in representative bands from 1500 kHz. to 24 GHz., both on earth and in space.

THE SQUEEZE ON AMATEUR BANDS

It is only natural that in the progress of radio, the use of the spectrum should become more economical, with tighter standards and closer scrutiny among all users to avoid wastage of frequency space. Even so, Amateur bands have been compressed unduly, and the same effects can be expected, particularly at v.h.f. and higher. It has been a continuous process since some of our popular bands had their origin at the Washington Conference of 1927.

Then there was world wide access of 500 kHz. at 3500 kHz., 300 kHz. at 7 MHz., 400 kHz. at 14 MHz.—the latter two being exclusive. At Cairo in 1938 some broadcasting came into the 7 MHz. band and in Europe Amateurs lost access to 3950-4000 kHz. At Atlantic City 1947 Regions were introduced, Region 1 Europe and Africa, Region 2 the Americas, Region 3 the rest.

At 3500 kHz. the Amateur access became, Region 1 300 kHz., Region 2 500 kHz., Region 3 400 kHz. At 7 MHz. it continued 300 kHz. in Region 2 exclusively for Amateurs, but only 100

kHz. in Regions 1 and 3 but sharing with broadcasting in another 50 kHz. In those regions broadcasting took 150 kHz. of the original Amateur band.

In the higher Amateur band at 14 MHz., the U.S.S.R. claimed the use of 100 kHz. for a reduced Amateur band for fixed services. The overall Amateur band became 14,000 to 14,350 kHz. At Geneva in 1959 the general table at 3500 kHz. remained the same, except that Amateur access was reduced in Australia to 200 kHz. and in India 10 kHz. At 7 MHz. in Regions 1 and 3 Amateurs were reduced to the exclusive part only, i.e. 100 kHz., that is one-fifth of what it was once.

Despite the losses in this period of 30 years there was an important indirect gain—the fact that Amateur Radio became recognised as a "Service" in the international negotiations concerned with the control of radio.

Before mentioning other bands, and particularly those of most importance for the future, I will refer to the general world attitude as it exists at present, towards Amateur affairs.

HOW DO WE STAND IN WORLD OPINION?

Leadership in the use of the radio spectrum used to be taken by the leading countries in science and technology. They pushed through the international legislation necessary, and in general Amateur Radio received reasonable provision. There was not much actual voting, policies being advanced largely by "force of character" at the international conferences. The last example of this was in 1947 at Atlantic City where the main decisions were contributed by the U.S.A., U.S.S.R., France and China. There were 72 signatories at Atlantic City, but at the Space Conference last year there were 98, an increase of one-third. The new countries that have built up the membership of the I.T.U. and contribute to the decisions of its conferences include many that do not have a background of technology, or a national climate favourable to Amateur Radio. Some other services such as broadcasting are favoured. In some developing countries it is not just a lack of understanding about Amateur Radio, leading to indifference towards its interests, but there is actual antagonism, to oppose the moves made by enlightened countries. The altruism of such moves is also brought into question

Some advanced countries use their influence against Amateur interests. This is probably because of economic, political and military reasons, and only a moderate degree of support within the particular countries.

In this unfavourable situation there are only very few countries in the world today who will come out boldly and advocate a helpful progressive attitude, when matters concerning Amateur Radio come into prominence, and when support is weak there is a readiness to vote quickly and dispose of the matter.

SPECTRUM DEMANDS AND CHANGING TECHNIQUES

The world of radio that we have mostly been concerned with has come about during the era of the ionosphere. We have experienced the good and bad features of ionospheric propagation. In negotiating for spectrum space the peculiarities of the ionosphere have had to be dealt with. While this kind of radio communication will now decline in importance and occupy a subsidiary role, it has meant that we have gained valuable experience, not only in operations, but in meeting the difficulties of obtaining satisfactory spectrum space for our activities. Valuable techniques of sharing have been developed.

Now major interest is in v.h.f. and higher frequencies. This applies to all radio services, brought about by improved equipment, the vast frequency width available, and most notably the improved types of services available by using space techniques.

One of the great changes due to space technique is that frequency bands once considered as of local, or national use, are now international. This has prevented the higher Amateur bands from being readily available for space use. It is also found that in many countries bands that were thought to be available for Amateur use are actually in operation for other terrestrial services. So new problems are coming to light.

The allocation table is rather complicated—at Atlantic City 1947 it had 120 footnotes detailing irregular use and these had increased at Geneva 1959 to 240 for a similar spectrum width. Last year at the Space Conference more were added. It becomes increasingly difficult to get anything in the nature of an exclusive world wide allocation, on any frequency whatsoever.

THE SPACE RADIO CONFERENCE, GENEVA 1971

Proposals were put before the Space Conference by a number of friendly countries to lead to Amateurs being able to use all their existing bands in space as well as terrestrially. There were pious hopes that there would not be much objection to this.

The result was the opposite. There was intense opposition, with a categorical denial for space operations in any of the shared bands. Space work was approved in exclusive bands, the only important ones of these being at 144 MHz. and 24 GHz. There was a very special exception for 3 MHz. at 435 MHz. to be used on a sharing basis with special restrictions, but apart from this there is no availability of space Amateur transmissions all the way from there up to 24 GHz. The allocation at 435 MHz. was only approved after the most exceptional actions by supporters at the conference.

The failure to get proper provision for Amateurs in space was accompanied by another failure. That is the obvious general lack of support for Amateurs and their requests, made through their respective governments.

This condition can be expected to continue at more general administrative radio conferences, when other bands also will be under scrutiny. (I have already referred to the general squeeze experienced in the last 25 years.)

I quote just one example to illustrate the atmosphere met at the Space Conference.

In the principal allocation committee, there were proposals for the five shared Amateur bands starting at 1215 MHz. to be approved for use in space The chairman proposed that all five bands should be dealt with together. **New Zealand** disagreed and proposed that each band should be considered **separately**, and statements in support of this action were made by **Israel, U.S.A., U.K., Philippines, Denmark, Canada, Italy** Statements against were made by **Sweden, Syria and Cuba.**

The chairman called for a vote on the New Zealand proposal and it was lost, 38 to 26 with 6 abstentions. So it was clear that of the 68 participants, a major favoured a summary package deal, rather than a close study that might well have found some little slice of a band that would have met Amateur needs. So the chairman called for a vote on the use of the bands by Amateurs, the result being:

Against Amateur use	46
For Amateur use	16
Abstentions	7

So it was not only the result, but the approach to it, that contains a lesson for us to study. There were numerous other somewhat similar examples.

HOW TO INFLUENCE THE SITUATION

The first thing is to deserve and retain the understanding and good will of the official government Administration. This is not only to promote good operating arrangements within our national boundaries, but also to try and have our country take its place for Amateur Radio at large when engaged in international negotiations. Obviously our own influence will only be the best if all our activities are pursued to the highest possible standard.

If all Amateur Radio National Societies in all countries gained support by their governments, things would be very different, and the kind of thing that occurred at the Space Conference would be unknown.

I.A.R.U. Headquarters has a continuance policy of promoting liaison of national societies with their respective governments. The Regional I.A.R.U. organisations work along the same lines. However, the road is by no means easy

I.A.R.U. has access to I.T.U. conferences, as an observer, and this is a great advantage. In addition to what might be done through Administrations by Societies, it gives direct contact with the scene of action, when matters affecting Amateurs are being decided. In big international conferences dealing with all aspects of radio usage the official delegations have little time to spare for concentrating on Amateur matters. Here is where an international society can assist, in adding an element of continuity, performing useful functions on the side lines of the meetings. Moreover, this is the only way to find out details of what really happens to questions that are vital to us.

(Continued on Page 14)

AMATEUR RADIO

(Continued from Page 13)

Experience has shown that the presence of observers can make the difference between success and failure in some of the outcome

Amateur Radio differs from all other radio services that it is, by regulation, voluntary. It, therefore, has no backup of income to meet expenses. Attendance at conferences is an expensive business It devolves on Societies, to see that the I.A.R.U. is present in effective strength at these critical times.

PRESENT IS TIME FOR OPPORTUNITY

Now is a unique time for Amateur Radio to use all its resources to advance its interests for the future, not only because of the importance of the present challenge, but also because the world organisation of Amateur Radio is in pretty good shape.

Despite the weaknesses we know of in many countries, I.A.R.U. and its set up, including organisations in the three I.T.U. regions, provides machinery through which proper actions can be taken. This has been proved in connection with the Space Conference last year, which conference was better prepared for in regard to Amateur interests than any other in history.

Moreover, such degree of success as was achieved can be linked very directly to the efforts of national societies and I.A.R.U. headquarters.

The radio frequency spectrum is in the process of being expanded right up to 275 GHz. and it is opportune for Amateur Radio to declare its ambitions, with a view to asserting their needs for spectrum space and sampling. Claims have been made in the past for Amateurs to be able to apply their talents to small sections through the whole spectrum.

The present is the time of the vast change in communications technique in which v.h.f. and higher becomes the principal important part of the spectrum. Old concepts of frequency allocation and regulation need to be scrutinised and perhaps changed in the light of this new order; Amateur Radio needs to be in the formative stages of new methods to ensure its rights are not missed out. (There is an opportunity here to wield influence through the I.T.U. Radio Consultative Committee, C.C.I.R.)

Countries who do not support the advance of Amateur Radio seem only recently to have been showing up definitely in this role. So it is opportune for Amateur Radio to identify its friends and marshal support as widely as possible while there may yet be a bit of flexibility in some of the attitudes.

ACTIONS TO TAKE

Our Association follows a policy of participating in I.A.R.U., and promoting its declared objectives, which include that of wielding international influence through the national amateur societies throughout the world. The points that have been made deal with features of the present situation which enhance the value of this participation.

We have tried, by our travelling to meetings in Sydney and Tokyo and collaborating with other member societies of the Region 3 Association, to get other countries in Region 3 to improve their influence, eventually through their governments.

This costs money. The present contribution both to Region 3 and in travelling expenses has to be regarded as a direct cost for some assurance of our satisfactory operating conditions in the future

It is important for all Amateurs to be aware of this subject, and to have it in mind, whatever branch of Amateur Radio they may specialise in.

In conclusion, let me express the opinion that our strength will continue to be in pursuing Amateur Radio vigorously, and enthusiastically, and concentrating on the characteristics in which it is unique, and which cannot be usurped by others. If we continue to aspire to excellence in these, our position is secure. ●

(Reprinted from I.A.R.U Region 1 "News" with thanks.)

MAILING PLATES WILL SOON BE REMOVED FOR UNFINANCIALS. HAVE YOU PAID YET?

WHY A CO-AXIAL SWITCH

By S. A. SHELDAHL*

Much of the radio frequency circuitry below 5 GHz. in the world of communications uses co-axial transmission lines. Within the communications gear there are many requirements for switching the radio frequency signal without leaking energy from one circuit to another and without causing a large discontinuity in the total transmission line. One common need is to switch a single antenna between a receiver and a transmitter The receiver must be protected from excess input power while a large discontinuity at its output could damage the transmitter. The co-axial switch solves the problem by maintaining the co-axial (or TEM) propagation mode and a good impedance match while providing both the necessary switching function and the same shielding against radio frequency radiation as a standard co-axial line.

The term "co-axial" is a slight misnomer, since most such switches incorporate a thin rectangular blade in either a round or rectangular cavity. The blade is moved to make contact with given output parts by an electromechanical actuator. The TEM propagation mode is maintained, however, and all the terminology of co-axial transmission line applies.

V.S.W.R.

The voltage standing wave ratio (v.s.w.r.) is the measure of discontinuity. Any discontinuity on a transmission line will reflect some power back toward the transmitter. The transmitted and reflected travelling voltage waves set up a standing wave whose peak to null voltage ratio defines the degree of discontinuity. A perfectly matched line has a v.s.w.r. of 1 to 1, whereas the v.s.w.r. of an open or short circuit is infinity. Most switches have a v.s.w.r. of less than 1.5 to 1 (usually less than 1.1 to 1) over the range of frequency to be applied.

V.s.w.r. can be measured directly by the use of a slotted line or indirectly by measuring the amount of reflected power using a directional coupler and converting this to v.s.w.r. The ratio of reflected power to transmitted power is called return loss and can be directly converted to v.s.w.r. by the use of published tables. Accurate v.s.w.r. measurements down to 1.04 to 1 are easily attainable with present equipment and calibrated terminations.

In general, v.s.w.r. increases rather smoothly with increased frequency and shorter wavelengths as small discontinuities become more noticeable. However, when the frequency is such that the electrical length of the switch is a sizeable fraction (¼ or greater) of the wavelength, the switch can become a transmission line transformer and peaks and nulls can occur in the v.s.w.r. characteristic. Care must, therefore, be taken in using any co-axial switch outside its published frequency range without some check on v.s.w.r. The above phenomenon can also work to the advantage of the switch designer and the user as it is possible to "tune" the switch to show a very good match over a small bandwidth at frequencies higher than expected.

The effect of frequency on v.s.w.r. also results in the fact that single input-multiple output and matrix switches are limited to lower frequency use than simple single pole double throw units unless special care is taken. For example, a radial configuration for a s.p. multiple throw can be used at much higher frequencies than an in-line configuration since all paths are matched and equal.

ISOLATION LOSS

Isolation loss, expressed in dB., is the ratio of power into the desired circuit to that leaking over into the undesired or "open" circuit. The degree of loss first depends on the air gap created by the movement of the blade. This gap is, in effect, a very small series capacitor in the transmission line. The capacitance can be measured or a reading of loss taken at any one frequency and the loss at any other frequency calculated rather simply. In general, the isolation loss across a simple air gap decreases 6 dB. for each doubling of frequency or 20 dB. per decade.

Higher isolation losses with less dependence on frequency can be had by using two blades to achieve a s.p.d.t. function. Each blade is common to one "pole" and can be designed to ground the centre conductor of the unused output connector. Now the air gap is of little consequence while contact resistance and shielding dominate. An increase of 25 dB. is not uncommon in the loss of a double blade grounding switch over that of a single blade unit.

The following table illustrates the comparative losses that can be expected:

Test Frequency	Typical Loss (Isolation) for Single Blade	Twin Blade (Grounding)
100 MHz.	50 dB.	75 dB.
400 MHz.	40 dB.	60 dB.
1 GHz.	25 dB.	50 dB.
3 GHz.	15 dB.	40 dB.

Special grounding connectors are also available which provide even better loss because of better shielding. Dow-Key offers a special connector on many series of switches which allows 100 dB. isolation at 300 MHz.

INSERTION LOSS

Insertion loss is the measure of power lost in the circuit as a result of passing through the switch. Losses of less than 0.2 dB. are common for frequencies up to 250 MHz. and most units can achieve losses of less than 0.5 dB. for their entire frequency range. Insertion loss is made up of at least four parts—IR loss, dielectric loss, contact resistance and reflected power.

IR or resistive losses (large at high frequencies) increase with the square root or frequency, but are held to a minimum by the use of short conductors in the switch and by plating all conductors with a good coat of silver or other highly conductive material.

Dielectric losses usually do not occur in co-axial switches since air (lossless) is the typical dielectric used. If other than air is used, losses are made negligible by using dielectrics such as teflon.

Contact resistance, dominant at low frequencies, is held at a minimum by gold plating all switch contact surfaces.

Reflection losses are a direct result of v.s.w.r. With higher v.s.w.r., more power is reflected by the switch and less power gets through to the load. The loss due to discontinuities is directly related to v.s.w.r. and return loss and is published in many places.

OTHER SWITCH CHARACTERISTICS

Field performance is also dependent upon other switch characteristics. Among these are operate and release times, pull-in and drop-out voltages, mechanical life and r.f. power ratings. The first three characteristics pertain only to electromechanically actuated switches.

Operate time is the measured duration between application of the coil voltage and the "at rest" condition of the blade contact in the actuated position. Typical operate time for a bladed switch is 15 to 20 msec.

Release time is the duration between removal of the coil voltage and the release of the blade contact from its actuated position.

Pull-in voltage is the minimum voltage that will actuate the switch. For a switch rated at 26v. d.c., pull-in might be 18 to 20 volts.

Drop-out voltage is the voltage at which the switch will release and return to the relaxed condition. For a switch rated at 26 volts, this might be 2 to 10 volts. Pull-in voltage is higher since the air gap between core and clapper must be overcome.

Mechanical life is the number of complete operating cycles to which a switch can be subjected while retaining rated performance. Typical life of a bladed switch is over one million cycles.

Power ratings for most bladed-type switches range between 100 and 1,000 watts maximum r.f. power. Hybrid co-axial vacuum switches can easily attain power ratings of 5 kw. at 30 MHz. and 1 kw. at 400 MHz. Unless stated otherwise, all power ratings assume that no power is on during the actual switching action.

Dow-Key makes many varieties of bladed switches including standard s.p.d.t. and d.p.d.t. units, radial and in-line single pole, multiple throw units, twin bladed switches and special patented connectors for high isolation losses, and manually operated units. We also make a line of hybrid switches using a co-axial cavity around a vacuum relay for high current and high voltage purposes (high r.f. power) and will soon be making remote operated step attenuators coupling the knowledge of good switch design to r.f. attenuators. ●

* Engineering Manager, Dow-Key; represented by R. H. Cunningham Pty. Ltd., P.O. Box 4633, Melbourne, Vic., 3001

Commercial Kinks

With Ron Fisher,* VK3OM

The continuing saga of the FT200. A letter from Ken Chiverton, VK4VC, tells how he tackled the job of connecting an external v.f.o. to his older model FT200. Over to Ken.

AN EXTERNAL V.F.O. FOR THE ORIGINAL FT200

"I have the model prior to the one with the external v.f.o. facility, and was determined to incorporate the mod. in my rig, despite the fact that no kit is available and the advice that the modification was too complex for the Amateur to carry out. I have now completed the mod. to use the FV200 and have fed in a v.f.o. to prove it works." (Ken is working on a home-made version of the FV200.)

"The job is not difficult if carried out in a logical manner and although it does take a little time, any subsequent effort could be carried out in much less time.

"Just a few points which may be of interest are that I made up a mounting bracket to hold the v.f.o. relay, but included an Omron PM08 or PM10 socket so that the relay could be plugged in instead of being soldered.

"I mounted the v.f.o. socket by removing the earth stud and cutting the socket hole so that the retaining screws for the socket fit in the original earth stud hole and the Aux. hole above. With a washer on the screws inside the chassis, the socket fits quite neatly. The earth stud was moved between the v.f.o. socket and the key jack towards the bottom edge of the chassis so that the wing nut does not foul the v.f.o. plug or the key plug when they are in place.

"When running the wiring, I carefully removed the harness binding and laid the new wiring in the existing hardness, re-binding when the wiring was complete. One point easily overlooked, but not imperative, is that the spare relay contacts on the acc. plug are moved from the antenna relay to the v.f.o. relay, and the now spare contacts on the antenna relay are used to short the receiver ant. input to ground on transmit.

"Note that the supply voltage for the buffer board is now taken through an 18K 3 watt resistor from the 150 volt rail at the end of R55 and not from the voltage regulated supply as shown in some earlier circuits.

"The main parts required for the modification are as follows:—

1 buffer p.c. board.
1 panel switch (v.f.o.).
1 escutcheon (v.f.o. switch).
1 7-pin socket and plug.
1 v.f.o. relay.
1 PM08 or PM10 Omron socket.
Sundry wire, screws, etc."

Ken says that if anyone is enthusiastic, he could supply a drawing of the buffer p.c.b.

This is just a brief run-down of the main points of the modification, but if there are any further queries, Ken will try and answer them for you.

Before making these modifications it is of course necessary to have on hand a circuit of the later model FT200. If you have trouble in obtaining one, write to "Commercial Kinks". I will be able to supply circuits of the appropriate sections, including the FV200 on the usual basis. So forward your requirements with an s.a.e. for costs involved.

One final point. Ken encountered some v.f.o. frequency shift which was found to be due to a drop in mains voltage which in turn dropped the supply to the voltage regulator board to below 11 volts. To remedy this, he adjusted R75 to increase this to between 13 and 16 volts. However, make sure that the voltage is not more than 16 volts when the mains supply is normal.

Thanks to Ken Chiverton, VK4VC, for the above notes.

An interesting letter from Jack Kelleher, VK3AIJ, in which he suggests a couple of simple modifications for FT200 owners. Firstly, Jack found the dial illumination a bit dull for his aging eyes (Jack's quote). To remedy the situation he applied some gloss white paint to the under side of the cabinet immediately above the dial escutcheon. Perhaps I could make the suggestion that a piece of aluminium foil glued to the same spot might be even better.

Jack found that the calibrator output was too strong on his FT200. I guess that this might depend on your favourite band. A reduction in the size of C21, the calibrator output coupling capacitor, from 10 pF. to 5 pF. did the trick in Jack's case.

As mentioned a couple of issues ago, work is going ahead on a noise blanker for the FT200. I had hoped to publish details this month, but as yet, I am not fully satisfied with results. However, details will be published as soon as possible.

Next month a discussion on modifications in general—including how not to do them! ●

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OPERATING FM HANDSETS ON AIRCRAFT

"QST" for Dec. 1972 recommends it is better for passengers to leave the rig in its case or your bag while in flight and goes on to say "The last thing Amateur Radio needs is a charge, founded or not, that we interfered with safety-of-life communications".

"A.R." WRAPPER CODES

New members and those who changed their address in the past year or so will have observed a coding which forms part of the address labelling. This is a simple code showing the month (01 to 12), year (2 for 72, etc.), Divisional membership (e.g. 4 for VK4), plus a letter showing whether an address change originated, as far as the Executive office is concerned, direct from the member or from a Divisional office. No letter indicates a new membership listing. Different codings (if any) appear on pre-1972 plates, which, because of cost and time involved, have not been re-done.

RECIPROCAL LICENSING

"Radio Communication" of Jan. 1973 advises that a reciprocal licensing agreement is now in force between the U.K. and Poland. Whilst on this subject, readers should note that the table printed on page 17 of Aug. 1972 "A.R." refers to reciprocity in relation to persons intending to settle in Australia. The tables do not refer to reciprocal licensing for visitors (up to 12 months) to Australia.

(Continued on Page 17)

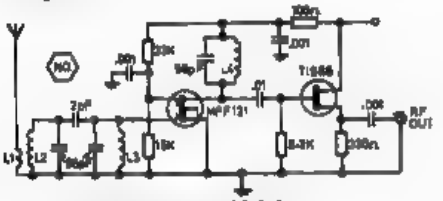
* 3 Fairview Ave., Glen Waverley, Vic., 3150.

TEN METRE PRE-AMP. FOR OSCAR 6

G. N. LONG,* VK3YDB, and
P. HAMMER,† VK3ZPI

● Besides a well matched ten metre aerial nothing else improves the reception of Oscar 6 like a good ten metre pre-amplifier. This article is intended to satisfy this need.

As may be seen in Fig. 1, the circuit utilises the very popular (and cheap) MPF121, which is the main circuit element, and a junction FET. Although a TIS88 is specified, a 2N3819 would be just as suitable and probably cheaper.



L1 2TURNS – L2, L3, L4, 10 TURNS
ALL COILS WOUND ON NEOSID FORMERS – F25 SLUGS
ALL COILS WOUND USING 24 2 2 GAUGE WIRE

FIGURE 1

The cascaded input coils were used to give greater protection against cross modulation in the MPF121 by providing better selectivity than one coil. The cross modulation characteristics are controlled by, firstly, the amount of unwanted signal reaching gate 1 of the MPF121 and, secondly (but no less importantly), by the bias on gate 2.

It was found that optimum biasing required a 2:1 resistive divider. Gate 2 is, in the case of the r.f. amplifier, bypassed for r.f. by a 0.001 μF. In the pre-amplifier a source follower is used to match the output impedance of the MPF121 to the input of the receiver (50 ohms).

If desired, this extra FET may be omitted if lower gain is acceptable. This may be done by using a coupling link coil (2 turns of 27 gauge wire) over the cold end of the drain coil.

Good v.h.f. constructional practices **must** be observed. Provided this is so, any sensible circuit board layouts may be used. ●

* 129 Tennyson Street, Elwood, Vic., 3176.
† 238 Bay Road, Cheltenham, 3192.

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BOOK REVIEW

THE RADIO AMATEUR'S VHF MANUAL—ARRL PUBLICATION

Although this edition of the Radio Amateur's VHF Manual retains the basic form and content of its popular predecessors, it has been completely revised for up-to-date v.h.f. and u.h.f. conditions.

Three new chapters on f.m. repeater principles and practice have been added. There are new single-sideband, solid-state, converter, pre-amplifier, transmitter and amplifier projects for the home builder of v..h.f. gear, with "how it works" information to back up the constructional chapters. Some 70 pages on antennas offer comprehensive information in this field. Wave propagation, u.h.f. and microwave techniques, interference causes and cures, test equipment for the higher frequencies, and even a history of hamming in the v.h.f. realm are covered in interesting detail.

All in all a very desirable book for all those interested in "an expanding world".

The review copy was received direct from ARRL through Magpubs. Copies are now available from book shops.

AMATEUR RADIO TECHNIQUES—RSGB PUBLICATION

For both the inveterate experimenter and those seeking a source of "State of the Art" inspiration, this Fourth Edition of a now well-established RSGB publication is a must.

Those who have an earlier Edition will find adequate additional material to warrant purchase of this issue.

For those who have not seen earlier editions the following chapter subject headings will provide some idea of the material covered:

1. Semi-conductors.
2. Components and Construction.
3. Receiver Topics.
4. Oscillator Topics.
5. Transmitter Topics.
6. Audio and Modulation.
7. Power Supplies.
8. Aerial Topics.
9. Fault-finding and Test Units Appendix—I.F. List.

Information is well presented, offering in many cases several alternative means of achieving an objective.

Both valve and solid-state circuit ideas are presented in an easily read and understood manner. Circuits presented represent an excellent reference to help in a transition from valve to transistor technology.

The review copy was received direct from RSGB through Magpubs. Copies are now available from technical book shops in Australia at an approximate price of $6.60.

☆

BAND PLANS

1.—**W.I.A. official "gentleman's agreement" on band sharing (policy reference 02/2, 1971, Fed. Convention Doc. 69.02.01) (all frequencies are in MHz.):—**

CW only:	PHONE and CW:
3.5 — 3.535	3.535 — 3.700
7.0 — 7.030	7.030 — 7.150
14.0 — 14.100	14.100 — 14.250
21.0 — 21.150	21.150 — 21.450
28.0 — 28.200	28.200 — 29.700

RTTY:
3.535, 7.040, 14.080, 21.080.

2.—**I.A.R.U. Region 1 Band Plan:**

CW only:
3.5 — 3.600
7.0 — 7.040
14.0 — 14.100
21.0 — 21.150
28.0 — 28.200

(U.S.S.R. stations use 3.525 to 3.600 for international working.)

3.500 — 3.510 and 3.790 — 3.8 reserved for international working.

PHONE and CW:
3.600 — 3.680
7.040 — 7.100
14.100 — 14.350
21.150 — 21.450
28.200 — 29.700

RTTY:

3.600	(plus/minus 20 kHz.)
7.040	(plus/minus 5 kHz.)
14.080	(plus/minus 10 kHz.)
21.100	(plus/minus 20 kHz.)
28.180	(plus/minus 50 kHz.)

3.—**U.S.A. and Possessions** (certain Pacific Islands are exceptions in the 80 and 40 metre bands):

CW:	PHONE and CW:
3.5 — 4.0	3.775 — 4.000
7.0 — 7.3	7.150 — 7.300
14.0 — 14.350	14.200 — 14.350
21.0 — 21.450	21.250 — 21.450
28.0 — 29.700	28.500 — 29.700

4.—**CANADA**

CW:
Same as U.S.A.

PHONE and CW:

3.725 — 4.000	
7.150 — 7.300	
14.100 — 14.350	
21.100 — 21.450	
28.100 — 29.700	

QSP

(Continued from Page 16)

SAFETY

"QST" for Dec. 1972 cites a couple of motor vehicle incidents where petrol in closed cans was in the compartment with a two-way radio. Fumes leaking out filled the boot (trunk) space and when the operator pushed the mike button it caused a spark at the relay contacts . . . and explosion.

NOVICES

"A recent change in the Amateur rules, effective November 22, 1972, makes it permissible for the Novice operator to use a variable frequency oscillator (v.f.o.) rather than having his transmitter be crystal controlled." "QST" article by Lew McCoy.

D.X.C.C.

Top of the A.R.R.L. D.X.C.C. ladder are W8AM and W9BG with 351 countries confirmed in the last listings. VK4QM is listed with 346 confirmations, but ZL1HY beats him at 348. A longish way down at 307 is VK3YL, but several ZLs are in between. On phone, VK5MS comes in with 341.

U.K. AMATEUR LICENCES

As at 31/10/72 the number of Amateur licences in force in Great Britain totalled 21,938. —"Radio Comm." Jan. '73.

21 GHz. BAND

World record for DX on 21 GHz. was set up last November by G3BNL and G3HEZ exchanging n.b.f.m. signals over a 48-mile path. "Rad. Comm." Microwaves, Jan. '73. It should be noted that the 1971 Space Conference deleted this band and substituted a band at 24 GHz.—i.e. 24-24.25 GHz.

KEEN LEARNERS

Andrew, a Matriculation student, last year gained his Elementary, Junior and Intermediate Y.R.C.S. certificates with honours all in the same year. But that is not all, he also sat for and passed the Amateur operator's certificate to gain his Amateur station licence, VK5NI. S.A. WI Journal, Jan. '73.

READERS OF "A.R."

Do not read this if you know the correct new address for the W.I.A. Executive which includes "A.R.," Magpubs, Subscriptions, address changes, Project Australia and a host of other non-Divisional matters.

G LICENCES

A comment brought on from an article in Dec. "Short Wave Mag." Any G licence holder who has not passed the Radio Amateur's examination and lets his licence lapse will not be re-licensed as a G without obtaining a pass in the R.A.E. regardless of how the original licence was granted. It is understood that much the same applies in respect of the Morse test. It is, of course, also well known that a 16 w.p.m. VK Morse pass will not be recognised for obtaining a full G call on reciprocal licensing.

ZAIRE (9Q5)

By order of the Director of P.T.T. of the Republic of Zaire, all Amateur licences have been cancelled. The effective date of this order was 20th July, 1972. (I.A.R.U Reg. 1 News, Dec. '72.)

MARITIME MOBILE SERVICE

A world administrative radio conference to deal with matters affecting the maritime mobile services will commence in April 1974 (22nd) at Geneva. The conference will deal only with frequencies above 4 MHz. . . . The 1967 Maritime Mobile Conference decided that all new ship stations shall be fitted with s.s.b. equipment after 1st January, 1973. Further, all coast stations shall be equipped for s.s.b. by 1st January, 1975. (I.A.R.U Reg. 1 News, Dec. '72.)

ISRAEL SYMPOSIUM

An "International Symposium of Radio Hams in the Satellite Era" is scheduled to take place in Israel from 24th to 29th June next on the occasion of the 25th Anniversary of Israel and Israel Amateur Radio. Information details from P.O. Box 18271, Tel Aviv.

PROJECT AUSTRALIS

Dr Peter Hammer, VK3ZPI, who built the command system for Oscar 6, visited Amsat Headquarters in Washington during January to discuss plans for future Oscar satellites. From these discussions the following is an outline of Oscar 7 (previously referred to as AO-B) and Oscar 8 (hitherto labelled AO-D). Note that Oscar 6, which is now in orbit, was known as AO-C pre-launch.

The orbit of Oscar 7 will be similar to Oscar 6. The launch is planned for mid-1974 with a design lifetime of three years for the satellite which will carry more solar cells than Oscar 6, thus enabling it to operate seven days a week. It is planned to carry a 5w, 2 mx to 10 mx transponder, similar to the one on Oscar 6, plus a similar back-up transponder with a 1w. output. In addition, the Euroscar 70 cm. to 2 mx linear repeater of about 10w. p.e.p., beacons in the 2 mx and 70 cm. bands for use when the appropriate repeater is off and a 24-channel morse code telemetry system are all planned to be carried along with VK3ZPI's highly successful command system which is the one now in use on Oscar 6.

Oscar 8 may be launched in about two years time. It is hoped this will be an entirely Australian-built package except for the solar cells.

Meantime Oscar 6 continues to operate extremely well. Amsat have advised that because of the failure of the 435.1 MHz. beacon the power budget now enables the satellite repeater to be on from Friday to Monday nights.

Operators through the repeater are asked to stay away from the centre of the passband to reduce congestion. The response is no better in the middle anyway.

Some temperature increases have been noticed lately which could be contributed to the now much-reduced rotation period of the satellite and the fact that it spends long periods in sunlight during the southern hemisphere summer. The temperature of the repeater p.a. has risen to 60 degrees C. at times.

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Technical Correspondence

ANOTHER LOOK AT LOW PASS FILTERS

Editor "A.R.," Dear Sir,

Being a manufacturer of wave filters, I was interested to read in January "Amateur Radio" the article by A. G. Earwicker, "Constructing an L.P. Filter".

The importance of fabricating the housing and the manner in which it is done cannot be over-emphasised. It is the major factor affecting the performance of a filter and the facilities required to make such a box are usually not available to the home constructor.

The idea of housing the unit in a tube is not new and has been used by me for many years. With this scheme, it is possible to build what I call a co-axial type filter, which, when connected into a co-axial cable of matching impedance, operates with very high efficiency.

Like all pieces of apparatus, it has some limitations, the main one being the number of sections, which are limited to two.

The doubts expressed by the Editor about Mr. Earwicker's filter are, unfortunately, all too true. A two-stage filter of appropriate construction can be made which will give the same attenuation figures as the Editor has produced and the insertion loss will be less. The graph shows a peak at 50 MHz., but it is suggested that when the filter is inserted and correctly matched into a transmission line, this peak will disappear and the curve will flatten off at the 50 dB. level. Such a figure is sufficient for all but the most stubborn case of t.v.i.

The use of springy "fingers" is not a solution to the problem of earthing the partitions and proper electrical bonding is essential. This introduces another problem, that of final adjustment, which is obviously impossible with a three-stage filter. This may account for the unusual inductance values specified. Finally, an efficient and reliable filter unit can only be produced if the construction is in a manner that enables it to be correctly adjusted and electrically sealed.

—B. E. Cabena, VK3BEC.

Product Review

By "Technical Assistant"

"DICK SMITH ELECTRONICS CATALOGUE, 1973, 2nd Edition"

The catalogue is a 44-page presentation on high grade paper with numerous diagrams and pictures of the advertised items. These are labelled individually with a letter of the alphabet, which corresponds to a letter alongside the catalogue price and description. One unusual feature of the catalogue is the fact that most items advertised have a brief description of either usage or electrical/physical parameters. This feature is of particular use for a newcomer to electronics, as well as those who are remote from the stores and must use mail-order.

Another feature not seen in other catalogues is a variety of information on, for instance, transistor lead identification, Amateur Radio information, formulae, etc., amounting to several pages. Dick says he intends that this information should eventually fill 50% of his catalogue. The information already occupies approximately 12%, and it is all very handy, every day use, "good oil". Dick can supply you with photo copies of information on most items that he sells at a nominal fee of 10c. Most people charge 20c.

I looked hard for things to criticise in the catalogue, and I found little that could be considered inaccurate. In "Amateur Information" I perhaps found the most problems and these were not necessarily Dick's fault. One I think is a typing error, the 11 metre band doesn't go up to 27.35 MHz., another the location of the Gippsland repeater, which is on Mt. Tassie—not Mt. Bess; possibly misinformation. These couple of inaccuracies constitute most of the errors I noted, so that's good in a catalogue of 44 pages.

One suggestion I would make is in regard to the advertising of the walkie-talkie units. Most advertisers say "P.M.G. approved" and the customer in many cases thinks no licence is required, so why not be one step above the others and say "Licence required". I know of a few people who have been caught by the P.M.G. without licences.

There are several beginner's type kits advertised as well as kits for a wide variety of projects published in various electronics magazines. In addition, a few books helpful to both beginner and advanced amateur/experimenter are carried. It isn't practical to go further into what this catalogue contains and I would suggest that you see Dick's advertisements in "Amateur Radio" for further information. The prices quoted are on a par with most other firms which provide a similar service and I quote from page 35: "Special Offer! Discount buyers, we guarantee our prices cannot be beaten . . . Try us! Last." Why not take him up on this offer?

One final point common to all advertisers in "Amateur Radio"—please support them, because if you don't it is a waste of their time and money to advertise. Say you saw it advertised in "Amateur Radio".

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EXOTICA

RECEIVER FROM U.S. SURPLUS

Recent U.S. journals ("73" Magazine, Sept. '72, p. 12) is typical) have carried advertisements offering the U.S. Navy Receiver Type AN/WRR-2 for U.S. $495. The advertiser claims these receivers cost the U.S.N. over $16,000 each.

Type AN/WRR-2 is a general purpose h.f. receiver covering 2-32 MHz., with synthesiser control in 0.5 kHz. increments and stability of 1 x 10^{7}/day. I.F. bandwidths are 0.35, 1.0, 3.0 and 12.0 kHz. and the receiver is capable of handling c.w., a.m., s.s.b. (u.s.b., l.s.b. or i.s.b.), f.s.k. or facsimile signals. A valve type equipment built about 1964, the receiver uses some 60 valves and operates from 115v. 50/60 Hz. 250 va.; weight 300 lbs.

A copy of the handbook is available at VK3ASC, from which information may be extracted by anyone seriously contemplating the purchase of a receiver which can be expected to cost about $1,000 to land after payment of customs duty and sales tax. Write VK3ASC, QTHR, or telephone 45-3023 after 6 p.m. only please.

Magazine Index

With Syd Clark, VK3ASC

"RADIO COMMUNICATION"

Sept.: Thoughts on a Multi-Mode Tx for 4M; Aerial Masts and Rotation Systems; Part 2, Simple "No-Cost" Curve Tracer; Supergain Aerials, Consumer Integrated Circuits in Amateur Design; Pt. 2, FM Receivers.

December, '72: A Wide Range Digitally-Controlled Local Oscillator, Assessment of H.F. Aerials using V.H.F. Aerials.

"SHORT WAVE MAGAZINE"

November, '72: Simple Two-Band V.H.F. Converter, Transistorised, An S.W.R. Bridge; Terminal Unit in Solid State for R.T.T.Y.

"HAM RADIO"

Aug.: Freq. Synthesizer for the Drake R-4 Receiver, Solid State 2304 MHz Pre-amplifier; Inexpensive Audio Filters, N-way Power Dividers and 3-dB Hybrids; Phase Shift Monitor Scope, Crystal Oscillator Frequency Adjustment, Direct Reading Capacitance Meter; Oscilloscope Voltage Calibrator, Mobile Operation with the Touchtone Pad; Digital IC Oscillators and Dividers; Comparison of FM Receiver Performance, Solid State Vibrator Replacement.

November, '72: V.H.F. F.M. Receiver; Performance of R.F. Speech Clippers; Automatic Solid-State Antenna Tuner; 5 MHz. WWV Receiver; First Steps to Satellite Communication; Carrier Operated Relay.

"QST"

Sept.: A High-Performance Solid-State Rx for the Novice or Beginner; Wide-Band FM with Crystal Control, Build a Dual-Differential Capacitor for Your Antenna-Tuning Network; RF Matching Techniques, Design and Example; A 70-watt Solid-State, UHF Amplifier; Limited Speech Recognition; "OAKEY" An Op-Amp Electronic Keyer; 1100 Watts on 160 Metres, Using a BC-458; A Closer Look at the HF Resonant Dipole.

December, '72: A Simple Frequency Counter for Receivers; V.F.O. Operating Hints for the Novice; Triggered Sweep Conversion for Oscilloscopes, New Life for the Heath VF-1 V.F.O.; Add A.V.C. to Your Swan 250; The Anatomy of a Solid-State Dipper; A.T.V. with the Motorola T44 U.H.F. Transmitter, Part 1: Simplified Impedance Matching and the Mac Chart; Notes on Custom-Built Repeater Gear.

"CQ"

Oct.: The Envelope Elimination and Restoration Transmission System for s.s.b.; Extending Use of Filters, A Scope/VSWR Monitor for the Shack, CQ Review, Heath SB-880 Digital Frequency Display; These Things We Call Countries, What Are They?

Nov.: Design Notes on a Moderate Power Solid State Transmitter for 1.8 MHz; CQ Reviews, "The Milda Digipat-60 Digital Frequency Counter".

December, '72: Oscar 6: It's in Orbit!, Satellite Turnstiles; More Ham Bands—Let's QSY to 30 Metres, Make Your Meter Readings Count; Vertical vs. Horizontal Polarisation on the V.H.F. Bands.

This month your reviewer was supplied with copies of "The Victorian VHFer", Volume 2, No. 3, September, 1972, and "Tuned Lines" Vol. 1, No. 1, October, 1972. The former is published by the VHF Group, Victorian Division, and is available for 13 cents per issue to VK3 and 20 cents to other States. The latter is stated to be available from the VHF and TV Group, N.S.W. Div., W.I.A., 14 Atcheson St., Crows Nest, 2065, by sending "enough stamped, self-addressed envelopes." Page size is 8¼ in. x 10¼ in. Postage will need to exceed the 7 cent minimum, and I suggest that senders attach 12 cent stamps.

TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

AWARDS COLUMN

With Geoff Wilson,* VK4MK

AUSTRALIAN D.X.C.C.

PHONE

VK6RU	318/346	VK4VX	306/312
VK5MS	317/343	VK5AH	295/314
VK4KS	313/329	VK4UC	292/293
VK3AHQ	308/326	VK4PX	291/294
VK6MK	304/327	VK4FJ	287/310
VK3APK	300/329	VK4TY	282/286

New Members:

Cert. No.	Call	Total
138	VK2NM	99/100
139	VK6HL	103/104

Amendments:

VK4SD	126/128	VK3AMK	342/343

C.W.

VK3AHQ	307/326	VK3NC	272/287
VK3QL	302/327	VK6RU	254/330
VK3YL	293/312	VK3YD	262/281
VK3APK	292/301	VK4VX	258/260
VK4FJ	282/320	VK4TY	257/272
VK3XB	284/300	VK3TL	252/280

Amendments:

VK3RJ 249/256

OPEN

VK6RU	318/346	VK4VX	307/309
VK4SD	317/334	VK4TY	304/321
VK4KS	314/334	VK6MK	304/327
VK3VN	311/332	VK4FJ	301/329
VK2EO	310/325	VK4UC	301/303
VK3APK	307/325	VK2SG	299/306

Amendments:

VK4PX 298/305

W.I.A. 52 MHz. W.A.S. AWARD

New Members:

Cert. No.	Call	Additional Countries
104	VK3ANP	3
105	VK4ZTK	1

Amendments:

98	VK3AOT	4
100	VK3AMK	4
103	VK4ZIM	6

AUSTRALIAN V.H.F./U.H.F. CENTURY CLUB AWARD

OBJECTS

1.1 This award has been created in order to stimulate interest in the v.h.f./u.h.f. bands in Australia, and to give successful applicants some tangible recognition of their achievements.

1.2 This award, to be known as the "Australian V.H.F./U.H.F. Century Club Award" will be issued to any Australian Amateur who satisfies the following conditions.

1.3 Certificates of the Award will be issued to the applicant who shows proof of having made one hundred contacts on the v.h.f./u.h.f. bands, and will be endorsed as necessary, for contacts made using only one type of emission.

REQUIREMENTS

2.1 Contacts must be made in the v.h.f. band (Band 8) which extends from 30-300 MHz., or in the u.h.f. band (Band 9) which extends from 300-3,000 MHz., but such contacts must only be made in the authorised Amateur bands in Bands 8 and 9.

2.2 In the case of the authorised bands between 30 and 100 MHz., verifications are required from one hundred different stations, at least seventy of which must be Australian. Previous Amateur bands 50-53 MHz. and 55-59 MHz. will be counted as the same band as 52-54 MHz. for the purposes of the Award.

2.3 In the case of the authorised Amateur bands between 100-200 MHz., verifications from one hundred different stations are required.

2.4 In the case of any one of the authorised Amateur bands in the u.h.f. spectrum between 300 and 3,000 MHz., verifications from one hundred different stations are required. The authorised bands are:

420 — 450 MHz.
576 — 583 MHz.
1,215 — 1,300 MHz.
2,300 — 2,450 MHz.

2.5 It is possible under these rules for one Amateur to obtain several certificates—one for each of the v.h.f. bands nominated in Rules 2.2 and 2.3 and one for each of the four u.h.f. bands nominated in Rule 2.4.

2.6 Commencing dates for the Award are as follows:

V.h.f. bands: 1st June, 1948
U.h.f. bands: 1st January, 1965.

All contacts made on or after these dates may be included.

OPERATION

3.1 All contacts must be two-way contacts on the same band, and cross band contacts will not be allowed.

3.2 Contacts may be made using any authorised type of emission for the band concerned.

3.3 Fixed stations may contact land portable/land mobile stations and vice versa, but land portable/land mobile station applicants must make their contacts from within the same call area.

3.4 Applicants, when operating either land portable/land mobile or fixed, may contact the same station licensee, but may not include both contacts for the same type of endorsement.

3.5 Contacts made with ship or aircraft stations or contacts made with the aid of repeaters or translators of any kind will not be allowed.

3.6 Applicants may only count one contact for a station worked as a Limited licensee with a Y or Z three-letter call sign who is subsequently contacted as full A.O.C.P. holder.

3.7 All stations must be contacted from the same call area by the applicant (except as below), although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign providing the applicant is still in the same call area.

If the applicant moves to another call area, contacts must be made from within a radius of 150 miles of the previous location to qualify for award purposes. If the distance of the new location from the old exceeds a radius of 150 miles, a separate application for a new award must be made claiming only contacts made from the new location.

All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the following details:—

4.4.1 Applicant's name and call sign, and whether a member of the W.I.A. or not.

4.4.2 Band for which application is made, and whether special endorsement is involved.

4.4.3 Where applicable, the date of change of call sign(s) and previous call sign(s).

4.4.4 Details of each contact as required by Rule 4.3.

4.4.5 The applicant's location at the time of each contact if land portable/land mobile operation is involved.

4.4.6 Any relevant details of any contact about which some doubt might exist.

APPLICATIONS

5.1 Applications for membership shall be addressed to:—

Federal Awards Manager,
W.I.A.,
P.O. Box 150,
Toorak, Vic., 3142,

accompanied by the verifications and check list, with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of $1.00, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the V.h.f./U.h.f. C.C. wishing to have their verified totals, over and above the one hundred necessary for membership, listed, will notify these totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

* C/o. P.O. Box 150, Toorak, Vic., 3142.

INTRUDER WATCH

With Alf Chandler,* VK3LC

From reports received it is quite evident that some Observers' receivers suffer from the old bug-bear, images. If you hear VIX on 7 MHz. or any other shore or coastal station on our Amateur bands you can bet your life it is an image.

Leith VK5LG, our VK5 Co-ordinator, has come up with a version of an old idea called "The Image Dipper". It is simply a series tuned trap between the antenna and earth connections of your receiver, and the principle is said to be so simple that it almost seems it won't work, but it does!

Capacitor is 140 pF. variable, and the coil is wound on an octal tube base, close wound with 22 gauge wire. 6.2-14 MHz., 8 turns; 13.8-23 MHz., 5 turns. Components may be altered to suit conditions, etc.

To use the "Image Dipper" simply tune the gadget down through its range while listening to a suspected Intruder. If the signal you are listening to does not disappear or at least greatly reduce in strength when both receiver and dipper are tuned to the same frequency, then the Intruder is an image or something similar.

An Intruder Watch net has been proposed to operate around 7030 kHz. on the second Monday of each month at 0930a. Co-ordinators will participate and it is hoped that members will also break-in from time to time. Everybody is welcome, and you may learn something of interest from it. Further publicity will be given as the idea progresses.

* Fed. Intruder Watch Co-ordinator, 1530 High St., Glen Iris, Vic., 3146.

CONTESTS

With Peter Brown,* VK4PJ

1972 "CQ" W.W.P.X. S.S.B. CONTEST

Australian Results (*certificate winners)

VK6CT*	all-band	754,134	1094	337
VK4UA*	"	48,160	335	70
VK4AK	"	19,125	88	75
VK3ACR*	10 mx	40,869	342	97
VK3XB	"	4,339	41	37
VK3SM*	15 mx	54,975	389	75
VK3APK*	40 mx	785,810	1011	254
VK3HE	"	7,594	59	47
VK3BBB	"	2,688	33	36

CONTEST CALENDAR

March 3-4: A.R.R.L. DX Phone, 0001z Sat. to 2359z Sun.

" 10-11: Israel DX, 0001z 10th to 2400z 11th.

" 10-11: B.E.R.U., 1300z Sat. 10 to 1300z Sun 11th. Br Commonwealth, c.w. only, all h.f. bands from 3.5 MHz.

" 10-11: World Wide V.H.F.

" 11: Worked All Britain, 0900z to 2100Z, h.f. 20, 15 and 10 mx.

" 17-18: A.R.R.L. DX C.W., 0001z to 2359z.

" 24-25: "CQ" W.W.P.X. s.s.b., 0001z Sat. to 2400z Sun. All h.f. bands, two x s.s.b. only; exchange RS plus Serial.

" 24-26: B.A.R.T.G. Spring r.t.t.y.

" 25: W.A. Britain, 0900z to 2100z, h.f. 20, 15 and 10 mx c.w.

24th to April 1: I.A.R.C. Propagation, Phone.

April 1: W.A.B., Phone, 0900z to 2100z, l.f. 160, 80, 40 mx.

" 8. W.A.B., C.w., as above.

" 21-22: Bermuda, Phone.

" 28-29: D.A.R.G. R.t.t.y.

Send s.a.e. for details of the above. I can cover most.

BRISTOL 75 ACTIVITY CONTEST & AWARD

1st Jan. 1973 to 31st August, 1973. To make contact with Bristol, England, Amateurs. A case of sherry to the highest scoring station outside U.K. ALL bands.

COMMENTS

You will see by the 1972 "CQ" W.W. P.X. s.s.b. results, from Frank Anzalone, "CQ" Contest Manager, that only ten of us forwarded logs in a world wide contest. I am sure that we can do better than that, so get a few log sheets prepared.

I do not get much time to even listen these days, but invariably I hear "There is not much about" from someone. If we could enter a few of the many contests, for this month at least, I am sure that we would find the bands quite active. Plan your openings and bands and put in a few hours. Everyone will benefit.

B.E.R.U. 1973 C.W. CONTEST

Trophy Medallions for VK Entrants

The B.E.R.U Contest will be held from 1300 GMT on 10th March to 1300 GMT on 11th March, 1973, c.w. only, 3.5 to 28 MHz., between stations in British Commonwealth call areas. VK1-8, VK9 Papua, New Guinea, Christmas, Cocos, Norfolk and VK0 Heard, Macquarie and Antarctica are all separate areas.

Two trophies have been presented for competition between VK stations. A silver medallion for the highest scorer in the official R.S.G.B. results, and a bronze medallion for a middle placed scorer decided on total VK entries divided by two, i.e. for 15 entries, to 8th placing, for 23 entries, to 12th placing.

Scoring: 5 points for contact, 20 bonus points for 1st, 2nd and 3rd contact in each call area (G, GM, GI, etc., count as one area)

Logs: separate page per band, with details of date and time GMT, station worked, number sent, number received, bonus points, contact points, claimed total score. Declaration that station was operated within rules and spirit of contest, and showing equipment details, to R.S.G.B. H.F. Contests Committee, C/o. D. J. Andrews, G3MXJ, 18 Downsview Crescent, Uckfield, Sussex, England, by airmail, please. Official result of contest with rules, etc., for next year will be sent to each entrant.

*Federal Contests Manager, Box 638, G.P.O., Brisbane, Qld., 4001

VK-ZL-OCEANIA DX CONTEST, 1973

W.I.A. and N.Z.A.R.T., the National Amateur Radio Associations in Australia and New Zealand, invite world-wide participation in this year's VK-ZL-Oceania DX Contest.

Objects: For the world to contact VK, ZL and Oceania stations and vice versa. Note: VK and ZL stations, irrespective of their locations, do not contact each other for contest purposes except on 80 and 160 metres.

Dates. Phone—24 hours from 1000 GMT on Saturday, 6th October, 1973, to 1000 GMT on Sunday, 7th October, 1973.

CW—24 hours from 1000 GMT on Saturday, 13th October, 1973, to 1000 GMT on Sunday, 14th October, 1973.

RULES

1. There shall be three main sections to the Contest:
   (a) Transmitting—Phone;
   (b) Transmitting—c.w.;
   (c) Receiving—phone and c.w. combined.

2. The contest is open to all licensed Amateur transmitting stations in any part of the world. No prior entry need be made.

Mobile marine or other non-land based stations are not permitted to enter.

3. All Amateur frequency bands may be used, but no cross-band operation is permitted.

Note: VK and ZL stations, irrespective of their location, do not contact each other for contest purposes except on 80 and 160 metres, on which bands contacts between VK and ZL stations are encouraged.

4. Phone will be used during the first week-end and c.w. during the second week-end. Stations entering both sections must submit separate logs for each mode.

5. Only one contact per band is permitted with any one station for scoring purposes.

6. Only one licensed Amateur is permitted to operate any one station under the owner's call sign. Should two or more operate any particular station, each will be considered a competitor, and must submit a separate log under his own call sign. (This is not applicable to overseas competitors.)

7. Entrants must operate within the terms of their licences.

8. **Cyphers:** Before points can be claimed for contact, serial numbers must be exchanged and acknowledged. The serial number of five or six figures will be made up of the RS (telephony) or RST (telegraphy) report plus three figures which may begin with any number between 001 and 100 for the first contact and which will increase in value by one for each successive contact.

Example: If the number chosen for the first contact is 021, then the second must be 022 followed by 023, 024, etc. After reaching 999, start again from 001.

9. **Scoring** (a) **For Oceania Stations other than VK/ZL**—2 points for each contact on a specific band with VK/ZL stations; 1 point for each contact on a specific band with the rest of the world.

(b) **For the rest of the world other than VK/ZL**—2 points for each contact on a specific band with VK/ZL stations; 1 point for each contact on a specific band with Oceania stations other than VK/ZL.

(c) **For VK/ZL Stations**—5 points for each contact on a specific band and, in addition, for each new country worked on that band, bonus points on the following scale will be added: 1st contact, 50 points; 2nd, 40 pts.; 3rd, 30 pts.; 4th, 20 pts.; 5th, 10 pts.

(d) **80 Metre Segment:** For 80 metre contacts between VK and ZL stations, each VK and ZL call area will be considered a "scoring area", with contact points and bonus points to be counted as for DX contacts.

Note: Contacts between VK and ZL on 80 metres only.

(e) **160 Metre Segment:** For 160 metres, contacts between VK and ZL, VK and VK, ZL and ZL, and VK/ZL to the rest of the world. Each VK/ZL call area will be considered a "scoring area" with contact points and bonus points to be counted as for DX contacts [Rule 9 (c)]

Note: A contestant in a call area may claim points for contacts in the same call area for this 160-metre segment.

For this purpose the A.R.R.L. Countries List will be used with the exception that each call area of W/K, JA and UA will count as "countries" for scoring purposes as indicated above.

10. **Logs:** (i) **Overseas Stations**—(a) Logs to show in this order: Date, time in GMT, call sign of station contacted, band, serial number sent, serial number received, points. Underline each new VK/ZL call area contacted. A separate log for each band must be submitted.

(b) **Summary** sheet to show the call sign, name and address (block letters), details of station, and, for each band, QSO points for that band, VK/ZL call areas worked on that band.

"All band" score will be total QSO points multiplied by sum of VK/ZL call areas on all bands, while "single-band" scores will be that band QSO points multiplied by VK/ZL call areas worked on that band.

(ii) **VK/ZL Stations**—(a) Logs must show in this order: Date, time in GMT, call sign of station worked, band, serial number sent, serial number received, contact points, bonus points. Use a separate log for each band.

(b) **Summary** to show: Name and address in block letters, call sign, score for each band by adding contact and bonus points for that band, and "all-band" score by adding the band scores together; details of station and power, declaration that all rules and regulations have been observed.

11. The right is reserved to disqualify any entrant who, during the Contest, has not strictly observed regulations or who has consistently departed from the accepted code of operating ethics.

12. The ruling of Federal Contest Manager of the W.I.A. will be final.

13. **Awards.**—**VK/ZL Stations:** W.I.A. will award certificates as follows:

(1) To the top scorer on each band irrespective of single-band or multi-band operation and irrespective of call area, i.e. a maximum of one award may be made for VK and ZL, for each band.

(2) To the top scorer in each VK and ZL call district, i.e. a maximum of 15 awards, 10 VK and 5 ZL awards may be made.

To be eligible for awards in either of the above mentioned categories an operator must obtain at least 1,000 points or there must be at least three competing entries in the category.

Overseas Stations: Certificates will be awarded to each country (call area in W/K, JA and UA) on the following basis:

(1) Top scoring "all bands" provided that at least three entries are received from the "country" or the contestant has scored 500 points or more.

(2) Other certificates may be awarded, to be determined by conditions and activity.

N.B.—There are separate awards for c.w. and phone.

14. **Entries:** All entries should be posted to **Federal Contest Committee, W.I.A., Box N1065, G.P.O., Perth, Western Australia, 6001**, or to **N. Penfold, 888 Huntriss Road, Woodlands, Western Australia, 6018.** VK/ZL entries to be received by 31st December, 1973. Overseas entries to be received by 22nd January, 1974.

RECEIVING SECTION

1. The rules are the same as for the transmitting section, but no active transmitting station is permitted to enter this section.

2. The contest times and logging of stations on each band per week-end are as for that transmitting section except that the same station may be logged twice on any one band —once on phone and once on c.w.

3. To count for points, logs will take the same form as for transmitting, as follows: Date, time in GMT, call of station heard, call of the station he is working, RS(T) of the station heard, serial number sent by the station heard, band, points claimed. Scoring is on the same basis as for transmitting section and the summary should be similarly set out with the addition of the name of the S.w.l. Society in which membership is held if a member.

4. Overseas stations may log only VK/ZL stations, but VK receiving stations may log overseas stations and ZL stations, while ZL receiving stations may log overseas stations and VK stations.

5. Certificates will be awarded to the top scorer in each overseas scoring area and in each VK/ZL call area provided that at least three entries are received from that area or that the contestant has scored 500 points or more.

NEW ADDRESS—W.I.A. EXECUTIVE:
P.O. BOX 150, TOORAK,
VIC., 3142.

VHF UHF

an expanding world

With Eric Jamieson,* VK5LP

Closing date for copy: 30th of month.
Times E.A.S.T.

AMATEUR BAND BEACONS

VK0	53.100	VK0ZVS, Macquarie Island.
	53.100	VK0MA, Mawson.
	53.200	VK0QR, Casey
VK2	53.450	VK2WI, Dural.
VK3	144.700	VK3RTG, Vermont.
	144.925	VK3QZ, Traralgon.
VK4	53.000	VK4WI/2, Townsville.*
	144.400	VK4WI/1, Mt Mowbullan.*
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	53.008	VK6VF, Bickley
	53.800	VK6TS, Carnarvon.
	53.950	VK6VE, Mt. Barker.
	144.500	VK6VE, Albany.
	146.000	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK8	53.300	VK8VF, Darwin.
ZL1	146.100	ZL1VHF, Auckland.
ZL2	146.200	ZL2VHF, Wellington.
	146.250	ZL2VHP, Palmerston North.
	431.850	ZL2UHF, Palmerston North.
ZL3	146.300	ZL3VHF, Christchurch.
ZL4	146.400	ZL4VHF, Dunedin.
JA	53.500	JA1IGY, Japan.
HL	50.100	HL9WI, South Korea.

* Denotes change from previous listings.

With the reading of these notes the equinoxial periods are not very far away and increased possibilities of trans-equatorial DX. Most of the JA IGY stations are to be found on 50.500 except JA1IGY on 53 500 (listed above). A listening watch is kept in Hong Kong on 50.100 by VS6DA and VS6BE, and other stations to our north will be gradually coming on the air.

SIX METRES

I am sure most operators would say the DX season which virtually finished last January was a very successful season. I was unfortunate enough to miscalculate the number of television receivers going faulty in the lead-up to the DX season with the result that the reconstruction of my 6 and 2 metre equipment to s.s.b. did not eventuate in time to operate but some listening was done, so have not been entirely left out of the picture, although the finger nails took a hammering whilst listening to some of the fine contacts being made at times! It was great to hear Rex VK9BP at Port Moresby getting so many contacts, his 400 watts of r.f. to a 6 el. yagi certainly made its present felt. When he has completed his 2 metre transverter and 4/250A linear he will be much sought after. Next season he will be the one to really be with it on 2 metres. (Please quote me as saying that, in your 1874 letters!!)

Channel 0 in Melbourne and Brisbane took a hammering this year, and so too did many other Channels up to Channel 3 here. ZL t.v. noted fairly regularly here, but the ZLs once again were rather conspicuous by their absence, maybe conditions were just not right for them, but the ZL band seemed to be in pretty good order on plenty of occasions during the mornings when t.v.i. should not have been a problem. Noted the absence of much operating from Darwin, but Geoff VK8ZGF from Alice Springs provided plenty of interest for all. Notice also that Wally VK5ZWW, of m/s fame, has invented in r.t.t.y. devices for use on 6 metres, and testing on both programmed and manual operation—typical answer, "Thank you for the call, one moment please while I change to manual operation!!" Really, Wally!

TWO METRES

This band was not left out of the DX picture and a number of notable contacts were observed, particularly the one between Tony VK5ZDY and Mick VK5ZDR to Wally VK5WG, followed later by 432 MHz. contacts. Tony VK5ZDY also featured in another good contact, this time via Channel B to VK3AJN at Wangaratta, which is a good haul. There have been quite a number of unconfirmed reports of long distance reception on 2 metres, viz. VK7 being heard in Sydney and further north at Boggabri (VK2ZAY); VK7 advised heard in VK4 around New Year, and about 28th Dec. Jim VK5ZMJ in Port Pirie was heard in Sydney with very strong signals. I have been advised, however, that definite contacts were made between Lance VK4ZAZ in Rockhampton and Bob VK3AOT, Roy VK3AOS and VK3CI on 22nd Dec.—good work chaps!

So with the various good contacts made and reports of others, I repeat again, watch out for 2 metres for the next two or three years, particularly during the first half of December, and so much the better if you can have an s.s.b. transverter going as well.

OPERATING HABITS

Having an opportunity to do some listening this DX season there are two comments I would like to make, both relating to 6 metres.

Firstly, a great increase in s.s.b. operating this time, with more to come it seems, and much of the contacting done by transceive method; some very good sideband is to be heard, too. The QQE06/40 seems to be a popular tube for the band.

The other comment concerns the operating habits of a few, there being too much haste by some in rushing in and not giving the finishing station a chance to complete his final over and sign off. Quite often the last half of his signing over was obliterated by the inconsiderate operator jumping the gun.

On 28 metres it is barely acceptable unless there are good reasons; and on 40 metres you will be told so in as many words if you try it.

So let's get things organised chaps and be considerate—no one wants to get their names in the various black books kept by many stations, including my own, for ungentlemanly operating. So give him a go, let the signing be done, then go in with the rest of the dog pile, and take your chance. If you have got a good signal, clean and undistorted, you will get the contact without a great deal of delay—but shouting into the microphone, particularly with s.s.b., just doesn't earn you any extra marks, except perhaps in the black book!

AMATEUR T.V.

Winston VK7EM has written to say he has been successful in crossing Bass Strait with a two-way QSO via a.t.v. with the exchange of picture with Peter VK3ZPA, first such contact on 13th Dec. last, using 432 MHz. band. Winston received reports with thanks also from VKs 2ZBZ, 3YEC, 3YGB, 3ZBB and 3ZSB.

A.t.v. activity on the north-west coast of VK7 is on the increase. Noel VK7ZNS has a camera built and Winston and Tony VK7AX have carried out many tests over an 8-mile path with a 90 degree bend in it—successfully bouncing signals from Mt. Montgomery south of Penguin, this being the only way to get signals into Ulverston using low power. Thanks for the letter, and we all hope your continuing tests are successful.

TRANSVERTERS

I do not normally comment on technical articles in other bulletins, but feel the article by Mike VK3ASQ, "Some Notes on 6 and 2 Metre Transverters" in the Jan. issue of the Geelong Amateur Radio-TV Club Newsletter very commendable, particularly as I have just passed through the stage of completing 6 and 2 metre transverters myself, and found my final ideas coincided exactly with those of Mike. The main points which will interest those in the construction stage of transverters are that zener diodes up to about 35 volts allow a QQE06/40 to be driven to plate currents much higher than 150 mA., than when a negative bias is taken from the bias line direct. Minus 33 volts will give about 60 mA. standing current from a 600 volt plate supply.

I agree also with Mike that the QQE02/5 makes a better mixer than a QQE03/12, with better linearity, and I also found that it was better to feed the 116 MHz. in parallel to the grids of the QQE02/5, and when mixed with 28 MHz. s.s.b. from an injection winding also to the grids, the output from the QQE02/5 being in push-pull cancelled most of the 116 MHz. energy, and the following tuned circuits completely rejected it. Feeding the 28 MHz. into the cathode of the QQE02/5 made mixing levels very critical, mixing in the grid was certainly easier.

I mention these points here because so many people at the moment are building transverters, and anything which can help to smooth their problems (and there are plenty) should be shared information. Perhaps Mike might like to send his article to "Amateur Radio" for publication. In the meantime, anyone having problems might like to contact either Mike or myself and information and diagrams could be sent on. Good luck anyway, but get those transverters going on 2 metres ready for the DX at the end of the year!

OSCAR 6

Great to see Amsat-Oscar 6 is still going well despite a few problems, and judging from the orbital prediction information still being circulated much interest continues in the satellite. No specific information is intended in this short paragraph but this column continues to recognise the excellence of the Oscar performance.

That about wraps it up for this month, so the column is closed with the following thought: "Reading the fine print may give you an education—not reading it will give you experience".—The Voice in the Hills.

— . . . —

SINGAPORE NEWS

The third A.G.M. of the Singapore Amateur Radio Transmitting Society (S.A.R.T.S.) was held on 25th January, 1973, when the following were elected to office for the ensuing year:

President—9V1QG
Vice-President—9V1RA.
Secretary—9V1OK.
Treasurer—9V1OD.
Council members 9V1NQ, QO, RF, RH and Samuel Kwan

The new council of S.A.R.T.S. extends a hearty welcome to any visiting Australian Amateurs and advises that Society meetings are held every last Thursday of the month at Sands House, Scout Hq., Clemenceau Ave., at 2000 hours. Correspondence to the Society should be addressed to:—

The Secretary,
S.A.R.T.S.,
P.O. Box 3788,
Singapore 1.

* Forreston, S.A., 5233.

you and DX

With Don Grantley*

Times: GMT

Firstly, I must apologise for the intermittent nature of this page over the past months. It has been a very hectic period here, but at last we have finally made it and are now settled down in the "sunshine state". My address for all future letters should be P.O. Box 26, Imbil, Qld., 4570, and the phone number is Imbil 65. For those who don't know the area, Imbil is situated between Nambour and Gympie, some 20 miles west of the main highway. The QTH is ideal for DX and with an area of some 250 acres I should be able to have a vee beam or two. Finally, should anybody be in Gympie at any time, you can find me in the telegraph room at the main Gympie Post Office.

There have been many happenings over the past few months, but to me the saddest was the news of the passing of W2CTN, Jack Cummings. Nothing can be added to the many words previously written about Jack, and his passing leaves a void which will be very difficult to fill. Geoff Watts, in his DX Newssheet No. 555 on Jan. 2, made the announcement briefly and very much to the point, thus: "Silent Key—John M. Cummings—The QSL Manager." I feel sure that all of us will endorse this tribute.

Whilst on the subject, there are several other silent keys which I feel should be mentioned here. CR7BC, Manuel Da Silva, 22/10/72, from a heart attack; HC1FG, Carlos; G3UJ, W. H. Allen, at Lisbon on 5/10/72; G2PL, Peter Pennell, President of F.O.C. for '71/72; G3ILO, Tom Spencer; PA0WP, Wilvan Ingaegeran, heart attack, former editor of "DX-press"; HI3JR, and finally HI8MMN.

There have been a number of special prefixes on the air to add to the confusion. CT7SH was Don CT1SH, using the special prefix for the last "CQ" Contest. His manager is CT1VE. The prefix 9C9 was used by EP stations for the Contest. 9C9TW had GI3HXV as manager. FY0RU used this one for the contests, QTH is Box 336, Cayenne. HH2JT counts only for the FX hunters, QTH is Box 585, Port au Prince. OA6CV is George K0WTM, new address is Box 825, Arequipa, Peru. A4FA regularly works manager G3LQP, and is ex-MP4MMB. DX4PAR was exhibition station commemorating 40th anniversary of the DU Radio Club; manager is DU1EJ.

JX6VO was Norman LA6VO, manager was LA1RQ. YA0CDRC is the A.R.A. Award Club station. OK5SZM, which went QRT on Dec. 31, was the Students R. Club from the first congress of Socialist Union of Youth at Bratislava; QSL to OK3TFM. TY5ABK, Mike, skeds manager W8CNL daily on 21325 s.s.b. at 1700. UK3OSB with all-band operation from Nov. 19 to Feb. 2 from Stalingrad to commemorate the 30th anniversary of the battle of that city in W.W.2. Several YB PXs are listed during Dec., YB5AAQ has W5ADZ as manager, YB-9AAT has W4YUU, whilst YB0ABE has K5GUZ.

IT9 stations are using IZ9 during Dec. HA25 prefixes can be used during 1973 by HA and HG stations to commemorate 25 years of post-war Amateur Radio. During Dec. and Jan., certain HA and HG stations were permitted to use the HA100 prefix to celebrate the Budapest centenary. WM4SFC was QRV from the Marshall Is. from the Marshall space flight centre, Alabama 35812 during the Apollo 17 mission. 9H3WFD, Ron, QRV from the World Peace Day Exhibition, send cards to the 9H1 Bureau.

IV5VEG is the special station, QRV Feb. 18, 25, and March 4 and 6, associated with the Viareggio Carnival Award which dates from Dec. 1, 1972. Manager is I5DOF. SQ5Z QRV from Warsaw technical exhibition; manager is SP5PMT. Finally, 5V7GE, Garland, is using this prefix for some unknown reason; QSL to Box 2, Bassari, Rep. of Togo.

A4FE has been on the air quite a bit of late. He is Steve ex-ZC4MO and he is QSL manager for all A4 stations. Cards should be sent to Box 961, Muscat.

VR3AC operators made 4,000 QSOs with 117 countries in 34 zones during their recent jaunt. They hope to return later this year and plan to work from KP6 and other rare spots.

YV0AA now QRV as from Jan. 10. They have been very active on all bands including 80 mx. All QSLs for this one go to Box 2285, Caracas, Venezuela.

VS6DR, HS3DR and XV5AC operators, John Lunsford and Scott Gant, planned to operate from Spratley Is. for five days from Jan. 18, signing IS1A or their own calls/Spratley.

Alberto I2KCT/5U7 on a scientific expedition is reported on 10 to 20 mx during Jan., and hopes to sign on from 5U, 5N, TT, TJ, TY, 9G, TU, TZ, 6W, 5T, EA9 and CN8. He has been reported on 14148 s.s.b. at 1915z.

If you have worked 5X5NA since mid-June 1972 you have landed a pirate, as Roger went QRT at that time. 5X5NK uses 14030 c.w., 14238 and 14330 s.s.b. Name is Udo, and manager is DL1HH.

WM1CC operated from Jan. 13 to Jan. 18 from Cape Cod for the Marconi Commemoration. At 0256 on Jan. 19 a copy of the original Marconi message was sent at 14 w.p.m., and a certificate will be issued to anybody who took a correct copy.

The International Reciprocal Operators Club has been formed, membership is free to all operators who hold a reciprocal ticket. To join you have to send a copy of your home and foreign reciprocal licences, a QSL with details of your operation abroad plus two IRCs to I.R.O.C., Box 11, Medway, Massachusetts, 02053, U.S.A. There is an award programme associated with this project and no doubt our award section has full details; if not, I have them here.

Bob VE5BAA, Bob VE5BAW, Gene VE5IP, together with film and sound crew, hope to head off in an ocean-going trimaran with the objective of activating the 40 most wanted countries, and they plan to devote their time in the next few years to a long stay in each of them. A DX-pedition trophy will be awarded each year to the station working them on most stops, bands and modes and the winner also gets a two-week expenses paid vacation aboard the trimaran. Transport troubles have caused them to postpone their Bhutan trip.

VQ9HCS is active from Aldabra until some time in March. He is using strong equipment, and is in keen demand. All cards should go to Box 84831, Mombasa, Kenya.

* P.O. Box 26, Imbil, Qld., 4570.

"20 YEARS AGO"

With Ron Fisher, VK3OM

The editorial pages of "Amateur Radio" during the early 1950s were greatly concerned with the introduction of television to Australia and its effect one way or another on Amateur operators. March 1953 looked at "Television Problems", which included such matters as t.v.i., the provision of regulations that would enable Amateurs to carry out television transmission and reception experiments. Up to this time all the television work carried out by Amateurs had been carried out over closed circuits. It's also interesting to recall that about this time, the Federal Government had set up a Royal Commission to investigate whether Australia could economically afford to run a television service, and if so, what changes could be expected to take place in the domestic life of the people. As the editorial predicted, the problems have been overcome.

Technical articles for March 1953 were quite diverse in their scope. A. H. Vonthethoff, VK5KW, described his method for "Neutralising an R.F. Amplifier with the use of a Grid Dip Meter". The grid dip meter is used as a field strength or r.f. output indicator. Quite simple and straight-forward. Dual grid modulation was the subject of an article by R. J. Whyte, VK2AHM. To provide amplitude modulation of an 807 or 1625 final amplifier, Jeff used a system of applying modulation to both the input and screen grids. A reprint from "Ham News" tells all there is to know about "Tank Circuit Qs".

Ed. Manifold, VK3EM, and Len Jackson combined in an absorbing article, "Hidden Xmitter Hunting—Whys and Wherefores". Ed. told how to construct a shielded loop antenna and then connect it to your receiver, then Len described the best way to track down the hidden transmitter. Hidden transmitter hunting, with the transmitter usually operating on the 80 metre band, was a sport that reached fever pitch during the fifties.

DX notes reported a general low in activity, with only twenty showing any signs of usable overseas contacts. V.h.f., on the other hand, appeared to be very busy with a good deal of portable activity on both two and six metres. The only DX reported was a ZL on six.

Ionospheric Predictions

With Bruce Bathols,* VK3ASE MAR. '73

Predicted band openings for March 1973 from Charts supplied by the Ionospheric Prediction Service Division are listed below. Times are G.M.T.

28 MHz.:				
VK2	to	SU		0800-0700
"	"	KH6		2200-0700
"	"	UA		0700-0800
"	"	VK9		2400-0700
"	"	W6		2200-0300
"	"	JA		2200-0900
"	"	5Z	L.P.	2200-0300
VK5	"	SU		0800-0600
"	"	KH6		2300-0700
"	"	UA		0000-0900
"	"	VK9		2400-0800
"	"	W6		2300-0300
"	"	JA		2300-0900
"	"	5Z	L.P.	2300-0300
21 MHz.:				
VK2	to	ZL		2300-0700
"	"	SU		0400-1000
"	"	KH6		2000-0800
"	"	ZS		0500-1000
"	"	G	S.P.	0700-1000
"	"	G	L.P.	0900
"	"	VK0		0100-0700
"	"	VE3	S.P.	2000-0100
"	"	VE3	L.P.	2300
"	"	UA		0400-1000
"	"	W1		2000-0100
"	"	VK9		2100-0900
"	"	PY		2200-0100
"	"	W6		2000-0400
"	"	JA		2200-1600
"	"	5Z	S.P.	0600-1000, 2200-0300
"	"	5Z	L.P.	2000-0300, 0800-0900
VK5	"	SU		0400-1200
"	"	ZS		0400 1200
"	"	G	S.P.	0800-1200
"	"	G	L.P.	1000
"	"	UA		0400-1200
"	"	PY		0800-1100
"	"	W6		2300-0400
14 MHz.:				
VK2	to	ZL		2000-1400
"	"	SU		1100-0100
"	"	KH6		0400-1500, 1700-2000
"	"	ZS		0400-1400, 2100
"	"	G	S.P.	0700-2000
"	"	G	L.P.	1900-0200, 0700-1200
"	"	VK0		2100-1200
"	"	VE3	S.P.	0300-0400, 1300-1900
"	"	VE3	L.P.	2100-0300, 1500
"	"	UA		0700-1800
"	"	W1		0300-0500, 1300-1800
"	"	VK9		2400-2400
"	"	PY		2000-1300
"	"	W6		0300-1200, 1500-1900
"	"	JA		0900-2300
"	"	5Z	S.P.	2100-0700, 1400
"	"	5Z	L.P.	0300-1100, 1500-1800
VK3	"	SU		1100-0100
"	"	ZS		0400-0800, 1000-1300
"	"	G	S.P.	0800-2100
"	"	G	L.P.	0800-1300, 2100-2400
"	"	UA		0800-1900
"	"	PY		2000-1300
"	"	W6		0400-1200, 1500-1800
VK4	"	SU		1100-2400
"	"	ZS		0400-0800, 1000-1600 2100
"	"	G	S.P.	0800-2000
"	"	G	L.P.	0700-1200, 1900-0300
"	"	UA		0700-1800
"	"	PY		2000-1700
"	"	W6		0400-1200, 1500-1900
VK5	"	SU		1100-0100
"	"	ZS		0400-0800, 1000-1400
"	"	G	S.P.	0800-1900, 2100
"	"	G	L.P.	0800-1300, 2100-2400
"	"	UA		0800-1900
"	"	PY		1100-1300
"	"	W6		0400-1200, 1500-2000
VK6	"	SU		1100-2000, 2300-0300
"	"	ZS		0300-0400, 1100-1700
"	"	G	S.P.	1000-2000, 2300
"	"	G	L.P.	0800-1400, 2200-2300
"	"	UA		0900-2000
"	"	PY		2300-1300
"	"	W6		0600-1200, 1600-1900
7 MHz.:				
VK3	to	SU		1500-2100
"	"	VK0		2400-1400
"	"	VE3	S.P.	0700-1200
"	"	VE3	L.P.	2100
"	"	PY		0800-0900
"	"	W6		0800-1500
"	"	JA		0900-2000

* 3 Connewarra Avenue, Aspendale, Vic., 3195.

EMERGENCY OPERATIONS

Licola (Vic.): **15 schoolboys and two teachers missing for two days on Mt. Tamboritha were rescued by helicopter.**

Amateur Radio operator Keith Scott, VK3SS, was the vital link between search headquarters and searchers. For 17 hours on the chilly summit of the mountain, Keith operated his well equipped mobile station.

A helicopter overhead and experienced bushmen on the ground searched the dense mountain timber for the missing people lost while on a school hike in the ranges.

Mobile 144 MHz. transceivers with the searchers kept in touch with Keith to relay their messages to police, whilst anxious parents and friends crowded round the radio van to listen to progress. They were delighted to hear that all had been found. They took for granted that the radio gear was part of the search headquarters equipment. They were unaware that the cost of that vital link was born by Keith in true Amateur fashion.

VK QSL BUREAUX

Because of the publication of incorrect information in some overseas magazines the following is the official list of VK QSL Bureaux with each appropriate address (all are inwards and outwards unless otherwise stated):

VK1: QSL Officer, C/o. Canberra Radio Society, P.O. Box 1173, Canberra, A.C.T., 2601, Australia.

VK2 correctly listed as: QSL Officer, W.I.A. Hunter Branch, P.O. Box 134, Charlestown, N.S.W., 2290, Australia.

VK3 QSL Bureau, Inwards: C/o. Mr. E. Trebilcock, 340 Gillies St., Thornbury, Vic., 3071, Australia.

(VK3 QSL Bureau, Outwards: C/o. Mr. W. L. Jackson, 23 Malane St., Carnegie, Vic., 3163.)

VK4 QSL Officer, G.P.O. Box 638, Brisbane, Qld., 4001, Australia.

VK5 QSL Bureau, C/o. Mr. Geo. W. Luxon, VK5RX, 203 Belair Rd., Torrens Park, S.A., 5062, Australia.

VK6 QSL Bureau, C/o. Mr. J. E. Rumble, VK6RU, G.P.O. Box F319, Perth, W.A., 6001, Australia.

VK7 QSL Bureau: G.P.O. Box 371D, Hobart, Tas., 7001, Australia.

VK8/9/0, SWL unlisted calls only: QSL Bureau, C/o. Mr. R. Jones, VK3RJ, 23 Landale St., Box Hill, Vic., 3128, Australia.

WANTED

Left-Right Output Transformers for Bendix MN26 Radio Compass Receivers. Units are marked T16 or A15064. Pay $4 each if okay.

M. O'Brien, Edgar Rd., San Remo, Vic., 3925. Phone 107.

FOR SALE

Type A Mark 3 gear, 3-9 MHz., 6v. DC and 240v AC, key or phone Transceivers, cheap.

M. O'Brien, Edgar Rd., San Remo, Vic., 3925. Phone 107.

NEW CALL SIGNS

OCTOBER, 1972

VICTORIA

VK3GE—I. R. Wade, 156 Hastings Rd., Frankston, 3199.
VK3AFY—C. J. Gamble, Lot 19, Rosmar Circuit, East Rosanna, 3084.
VK3AHI—J. C. Eagan, Apartment 4, 17 Forster St., West Heidelberg, 3081.
VK3AMQ—M. G. White, 62 Peter St., Box Hill North, 3129.
VK3AYC—H. P. Caudell, Lot 77, Regina St., Kilsyth, 3137.
VK3AYE—Central Gippsland Youth Radio Club, Visual Education Centre, Gray St., Traralgon, 3844.
VK3BDT—R. D. Turner, 15 Killearn Ave., Point Lonsdale, 3225.
VK3RAM—The Wireless Institute of Australia, Race St., Midland Zone, Bendigo, 3550.
VK3RTG—The Wireless Institute of Australia, Colonial Gas Association, Rooks Rd., Vermont, 3133.
VK3YHF—R. J. Abernethy, 62 Wiltonvale Ave., Werribee, 3030.
VK3ZBV—J. Quigg, 1 Walker Pde., Churchill, 3842.
VK3ZDJ—E. G. Jarman, Cr. Stanley's and Merricks Roads, Merricks, 3916.
VK3ZDM—R. M. Mullavey, 49 Pickford St., East Burwood, 3151.
VK3ZDP—G. Padula, 171 Lygon St., Carlton, 3053.
VK3ZHG—H. R. Gillis, 105 Bladen St., Laverton, 3028.
VK3ZWH—A. F. Whillance, 2 Tate St., East Geelong, 3219.
VK3ZWM—D. E. Hill, Cr. Riverside and Eleventh Sts., Mildura, 3500.

QUEENSLAND

VK4LU—R. J. Hinks, Station: 177 Ibis St., Longreach, 4730; Postal: C/o. Police Station, Longreach, 4730.
VK4NU—R. N. Boland, 44 Birch St., Cairns, 4870.
VK4ZAY—C. E. Benson, 30 Chandler St., Garbutt, 4814.
VK4ZBA—A. Christopher, 21 Keenan St., Margate, 4019.

SOUTH AUSTRALIA

VK5DQ—C. R. W. Ashton, 54 Harvey St., Whyalla Norrie, 5608.
VK5KQ—W. N. Hart, 12 John Ave., Tranmere, 5073.
VK5WB—I. J. Champion, 16 Tarranna Ave., Parkholme, 5043.
VK5ZAP—J. G. Badcock, 32 Forest Ave., Hawthorndene, 5051.
VK5ZAS—A. W. Q. Kriek, 36 Glyde St., Port Augusta, 5700.
VK5ZIX—A. J. Stacey, 5 Blacktop Rd., Hillbank, 5112.
VK5ZPB—C. Gilbert, 170 East Tce., Adelaide, 5000.
VK5ZRZ—W. S. Baynes, 29 Starthspey Ave., Hazelwood Park, 5066.

WESTERN AUSTRALIA

VK6MT—A. T. Mason, 127 Graylands Hostel, Graylands, 6010.
VK6NT—J. G. Denny, 29 Tonbridge Way, Morley, 6062.
VK6RT—R. H. Collier, 941 Wellington St., West Perth, 6005.
VK6RY—R. H. Latham, D.C.A. Residence No. 5, Fourth Ave., Wittencoom, 6752.
VK6ZBJ—D. L. Cline, 4/365 Cambridge St., Wembley, 6014.
VK6ZDF—T. W. Robinson, 5 Jarvis St., Bunbury, 6230.
VK6ZHC—R. H. Chapman, 6 Jenner Way, Ross-Moyne, 6155.
VK6ZKF—R. A. Fable, 6/3 Acton Ave., Bentley, 6102.

TASMANIA

VK7ZAD—D. M. Lawson, 47 David St., Launceston, 7250.
VK7ZAP—A. P. Boon, 37 Pottery Rd., Lenah Valley, 7008.
VK7ZKB—K. A. Brown, 7 Sunnyside Rd., New Town, 7008.
VK7ZSE—S. J. Elliott, 18 Adelaide St., East Launceston, 7250.

NORTHERN TERRITORY

VK8ZB—G. L. Stephens, 9 Wagaman Tce., Wagaman, Darwin, 5792.
VK8ZKA—P. M. Van der Velden, 2506 Henry Ellis St., Alawa, 5792.

TERRITORIES

VK9ZED—P. R. Harden, Station: Section 32, Lot 18, Le Hunt Rd., Port Moresby, P.N.G.; Postal: P.O. Box 139, Port Moresby, P.N.G.
VK9DD—D. E. Herbert, Station: Section 73, Lot 3 Boroko, P.N.G.; Postal: C/o. O.T.C. (A), P.O. Box 56, Port Moresby, P.N.G.
VK9CS—C. S. Shaw, Station: Section 46, Lot 41, Boroko, P.N.G.; Postal: P.O. Box 6853, Boroko, P.N.G.
VK9MF—R. A. Ford, Station: Flat 70, Karage St., Saraga, Port Moresby, P.N.G.; Postal: P.O. Box 6592, Boroko, P.N.G.

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For full details, see January 1972 "A.R.," page 23.

FOR SALE

Yaesu FT-101, June 1971 model. Little use, mainly as mobile. $495. VK2BEL, QTHR, Ph. (02) 449-4324.

Transistor Transceiver, 3.5, 7.0, 14.0 MHz. SSB; Rx all transistors with internal 12v. bat.; Tx transistors plus driver and o.p. 6DQ6Bs; mobile and AC supplies. Built by VK3DH, QTHR, Ph. (03) 82-3020 or 751-1281. $120. Comes with handbook.

FT-DX-100 Transceiver, excellent condition, with Mk. 3 4-band Helical Whips and Base Assembly. $400 o.n.o. VK2ALK, Ph. Sydney 528-7697.

Eico 753 Transceiver, 3-band AM-CW-SSB, vox, offset rx tuning, etc., complete with mike and p.s.u. Perfect condition, $200. 12v. DC p.s.u. optional. VK3BAJ, Ph. (03) BH 648-5610, AH 725-5223.

6 mx AM Tx, H/B, push-pull 6L6 modulator, CQV04/15 final, dynamic mike, spare final and modulator, $25. 144 MHz. MOSFET Converter, E.A. 1970, partly tuned, $25 with xtal. Ph. Sydney (02) 663-7336.

A.W.A. MR6A FM Mobile Transceiver, six channels capability, Ch's "1" and "B" included, perfect condition, $90. B. Bathols, VK3ASE, 3 Connewarra Ave., Aspendale, Vic., 3195. Ph. 90-8424.

AM Solid-State 6 mx Tx-Rx TCA1676, $50; FM Pye Ranger hi-band, converted 2 mx, $30; both less xtals. VK2ZSC, QTHR, Ph. (02) 85-5324.

FT-DX-400, complete, excellent condition, $400. VK3ASL, QTHR, Ph. (03) 83-6285.

21-inch Colour TV, P.A.L., new tube, $400. Star SR600 Comm. Rx, $130 o.n.o.; BC348, AR7 Rx's with B, C, D and E coil boxes, $50 each. VK2ZPM, Ph. (02) 476-2304.

KW600 Linear Amp., 600 watts p.e.p., 572B in g.g., $185. Pioneer Stereo Tuner Amp., SMQ300B, 40 watts op., $100. Ron Fisher, VK3OM, Ph. (03) 560-9211.

WANTED

Buy or borrow: Handbook or circuit for A.W.A. "Wireless Set No. 11 (Aust.)". VK4QW, QTHR, Ph. 80-7367.

A.C.U. for AT5 Tx, multi-pin plugs and aerial connector for both units. Also circuit diagram and technical details of No. 62 set. VK5OQ, C/o. 14 Quadrant Tce., Seaford, S.A., 5169.

C.R.O. Tube Type 5FP7 in good order urgently required. Contact VK5GV, R. C. Grivell, 43 Lincoln Cres., Pooraka, Sth. Aus., 5095, or Ph. 62-5152.

By Beginner. BC348 Manual and conversion data. Also "CQ" Sept. 1956, Feb./March 1959 to borrow or buy. T. J. Moloney, Ph. (02) 94-3160.

All-band CW Transceiver or CW Transmitter-Receiver combination. Good quality. Post price and particulars to P.O. Box 52, Khancoban, N.S.W., 2642.

Teletype or other make "Tape Transmitter Distributor" to complete RTTY station. VK4EV, QTHR, Ph. (072) 55-4306.